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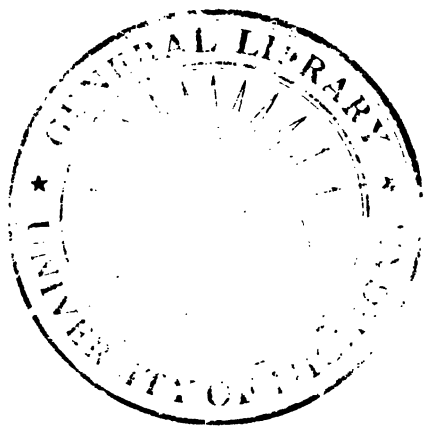
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KINDRED INSTRUMENTS

Viol Type.

Case 119. Page 51.



THE METROPOLITAN MUSEUM
OF ART

With the generous assistance of

Mrs. John G. Cowan, Jr.

35 East 57th Street

NEW YORK

MUSICAL INSTRUMENTS
OF ALL NATIONS

Prepared Under the Direction, and Issued With the
Authorization, of the Donor

IV

HISTORICAL GROUPS

GALLERY 39

NEW YORK

PUBLISHED BY

THE METROPOLITAN MUSEUM OF ART

1905



*From Library of
C. K. Head
5-12-57*

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3204	89	3241	92	3399	4	3501	150
3205	89	3242	92	3400	5	3502	150
3206	89	3243	92	3409	100	3503	150
3207	90	3244	92	3410	100	3504	150
3208	90	3245	92	3411	100	3505	150
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PREFACE.

Gallery 39, to the description of which the contents of this catalogue is devoted, was opened to the public in 1903. The exhibits which it contains fall into six groups more or less independent in character: 1. The first consists of a number of prehistoric instruments, either original or reproductions, and is designed to show the oldest examples of musical instruments which have been preserved. 2. The second consists of a series of drawings illustrating the distribution and use of musical instruments among civilized peoples from the earliest times to the 13th Century A.D. 3. The third consists of a group of exhibits showing the leading European instruments with their kindred forms in different countries. 4. The fourth is devoted to the illustration of the method used in the construction of some of the more important European instruments; as, for example, the violin, organ, and piano. 5. The fifth consists of a number of keyboard instruments, added since the opening of the earlier rooms, together with a series designed to illustrate the development of the piano. 6. The sixth group, still incomplete, covers a series of plaster casts, reproductions of examples of ancient sculpture in which musical instruments figure.

1. In the original plan of the collection two gaps were left unfilled: first, prehistoric instruments; and, secondly, the instruments of the oldest civilizations. By prehistoric instruments, we refer not to the primitive forms which are still in use among the savage peoples of to-day, but to those older remains which have been found in caves, mounds, or the graves of peoples of whose history and habits we have no other authentic records. The few specimens of the latter which the collection contained, e.g., the flutes of Santa Catalina, were introduced in the appropriate place in the room devoted to the

savage instruments, but no especial division was given to this group. In like manner, the connection between the European instruments and the older civilizations from which they were derived was indicated by the Egyptian Type Case (Gallery 36, Case 63), but no attempt was made to follow out the line of development thus suggested in detail. The opening of the present room has afforded the opportunity to do something toward filling the gaps thus left. Through the courtesy of Prof. Putnam, of Cambridge, and others, it has been possible to secure reproductions of some of the more important prehistoric instruments known to be in existence, and to these have been added such originals as already formed part of the collection. In the group thus formed we have the earliest remains of musical instruments known to be in existence, and the prototypes of the more advanced forms, to the exhibition of which the rest of the collection is devoted.

2. What has been done for the prehistoric instruments by reproduction has been done for the instruments of the older civilizations by a series of pen and ink drawings. Through the courtesy of Mr. Galpin, whose interest in the collection and whose help have been here as ever invaluable, a chart has been prepared illustrating the history of the leading types of instruments from the earliest time to the 13th Century A.D. Here the idea suggested in the Egyptian Type Case (Gallery 36, Case 63) has been carried out in detail. Beginning with Egypt and Assyria, the spread of the different forms has been traced Westward through Greece and Eastward through Persia, India, and China to America. In every case the illustrations used are derived from ancient sources, either sculptures and bas-reliefs or early manuscripts. For the drawings the donor is indebted to her friend Miss Clara Buffum, who has most skilfully carried out in detail the plan outlined by Mr. Galpin.

3. In the side cases (Nos. 113-125) we have a group of instruments designed to illustrate the relation of the different European instruments to their prototypes and parallels in other countries. Here the parallelism briefly referred to in the notes on kindred instruments in the European Catalogue (pages 17,

III, etc.) is exhibited to the eye. The groups are ten in number, covering selected examples of the Stringed type, the Wind, Vibrating Membranes, and Sonorous Substances. In each case the European instrument is outlined with yellow cord, and the parallel forms of other countries grouped around this as a centre. The list is by no means exhaustive, but sufficient examples are given to represent the most important types. It is interesting to note what widely different forms the same type may assume under different conditions. Who, for example, that did not look below the surface to the principles involved, would find any connection between the Vina and the Lute or the Nose Flute of the Malay Peninsula and the Boehm Flute of the modern orchestra?

4. The remaining side cases, with the exception of those containing the early American pianofortes, are devoted to a series of exhibits designed to illustrate the construction of the violin, flute, and cornet, the early and present forms of organ actions, and the action of the modern pianoforte in detail. In the case of the first three, each step in the development is represented from the raw material to the finished instrument, together with the more important tools used in the process of construction. In the preparation of these valuable exhibits, thanks are due to Mr. Hutchings, of the Hutchings Votey Organ Company, of Boston, to Messrs. Strauch Bros., and Mr. William Ruhenbeck, of New York. The two former have furnished an exhibit of organ and piano actions complete in every detail, as well as the descriptive matter explaining the same; the last has provided an interesting model of an upright piano, showing the method of stringing, with a section of the action in place. Mr. Ruhenbeck has also kindly prepared the article describing the art of piano building. In the preparation of the violin exhibit, as well as for the descriptive matter relating thereto, thanks are due to Mr. Oettinger, formerly with Messrs. Elias Howe & Co., of Boston. The groups illustrating the construction of the flute and cornet were arranged by Messrs. Penzill & Muller, of New York, the descriptive matter having been kindly furnished by Mr. Harry Bettoney, of

Boston, and Mr. Nelson, of the Standard Band Instrument Company, of the same city.

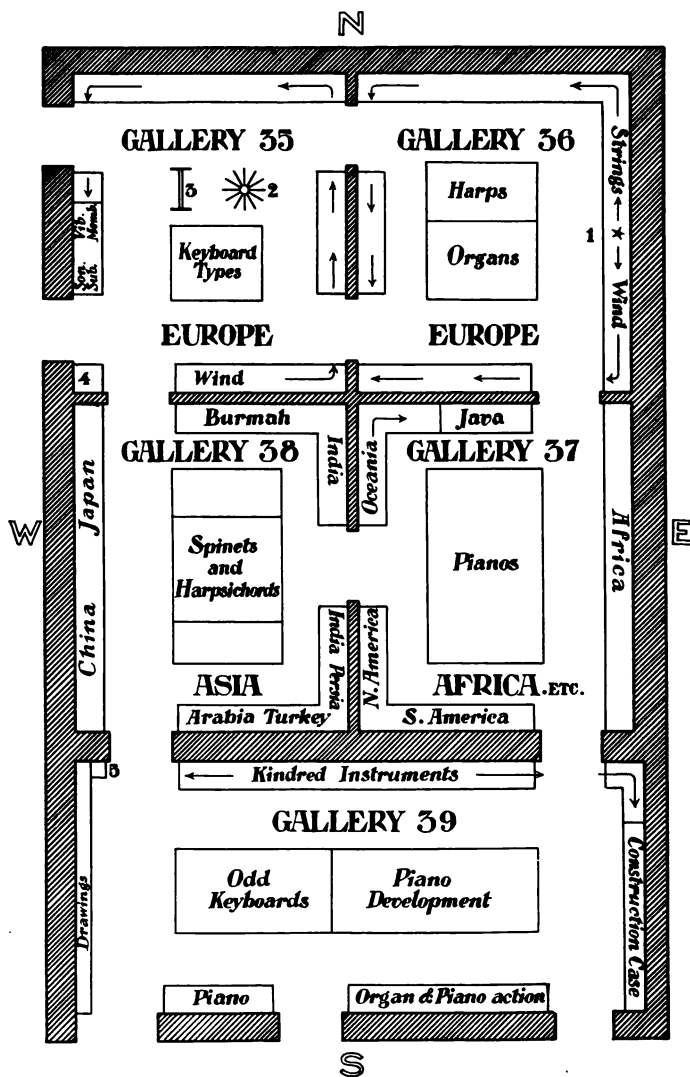
5. The growth of the keyboard collection has rendered necessary a rearrangement of this exhibit. A number of the larger instruments acquired since the opening of the earlier rooms have been placed in this gallery. Among them may be mentioned the Harpsichord believed to have been the property of Pope Innocent X., and the Claviorganum, once in the collection of Mr. Carl Engel. Special attention is called to a series which has been arranged to illustrate the history of the development of the piano. The specimens shown include the work of Cristofori, the inventor of the pianoforte (the earlier of the two existing examples of his handiwork); the "Viennese Action," as introduced by Andreas Stein; an example of the square form of piano introduced into England, in 1760, by Johannes Zumpe; together with specimens of the work of Clementi, Erard, Broadwood, and other noted piano-makers. The group of early American piano-makers (Cases 136-138) is represented by Charles Albrecht (Central Case), Benjamin Crehore, Conrad Meyer, and Thomas Loud.

6. The drawings described under Section 2 have been supplemented by a series of plaster casts of musical subjects taken from the ancient sculpture of Assyria, Greece, and Western Europe. These have been classed as Musical Accessories, and will be found indexed under that head. The collection is as yet incomplete, but it is hoped in time that many more interesting examples may be added.

In addition to those to whom acknowledgment has already been made, the donor desires to express her renewed thanks to the authorities of the Museum for their unfailing courtesy and consideration; to Dr. Charles R. Gillett, librarian of the Union Theological Seminary, who has kindly consented to see this catalogue through the press; and, above all, to her friend Miss Fannie Morris, whose assistance in the preparation of this and of the preceding catalogues has been constant, and without whose faithful, intelligent, and untiring labor the work could never have been done.

M. E. B.

PLAN OF GALLERIES



1 EGYPTIAN TYPE CASE

3 CHRONOLOGICAL CHARTS

5 PREHISTORIC INSTRUMENTS

2 PORTRAITS

4 MANUSCRIPTS

GUIDE TO THE COLLECTION

GALLERY 38.

INSTRUMENTS OF THE ORIENT.

West Wall. China, Japan, Corea, Siam.
North Wall. Burmah, India.
East Wall. India, Asiatic Russia, Persia.
South Wall. Turkey, Arabia.
Small Central Cases. Odd Asiatic Instruments.

EUROPEAN KEYBOARDS.

Central Case. *Plucked Strings*: Virginals, Spinets, Harpsichords.

GALLERY 37.

INSTRUMENTS OF SAVAGE TRIBES AND SEMI-CIVILIZED PEOPLES.

East Wall. Africa.
North Wall. Java, Oceania.
West Wall. Oceania, Philippine Islands, North America.
South Wall. Central and South America.

EUROPEAN KEYBOARDS.

Central Case. *Struck Strings*: Clavichords, Pianofortes.

GALLERY 36.

EUROPEAN INSTRUMENTS.

Classified under four heads: STRINGS, WIND, VIBRATING MEMBRANES, SONOROUS SUBSTANCES. To study the classification, the starting point should be the EGYPTIAN TYPE CASE (Middle Case, No. 63, East Wall, see Plan of Galleries). The STRINGED INSTRUMENTS are to the left of this case, arranged under the three divisions of that class: *Plucked Strings*—Harp, Lute, Psaltery, etc. *Struck Strings*—Dulcimer, Keyed Cither, etc. *Bowed Strings*—Viol, Violin, Vielle or Hurdy Gurdy, etc. The WIND INSTRUMENTS are to the right of the Egyptian Type Case, arranged under the three heads of that class: *Whistles*—Vertical and Transverse Flute, etc. *Reeds*: Beating Reeds—Clarinet, Oboe, Bagpipe, etc.; Free Reeds—Accordion, Concertina (Central Case and Wall Case 63a). The third division, *Cup Mouthpieces*, Cornetto, Horn, Trumpet, etc., follows in Gallery 35.

East Wall. EGYPTIAN TYPE CASE. To the left, STRINGED INSTRUMENTS. *Plucked Strings*: Harps, Lutes, Calasciones, Theorbos, Chitarrones, Mandoras, Pandurinas, Cavacos, Balalaikas.
North Wall. *Plucked Strings*: Mandolines, Guitars, Harp Guitars, Lyre Guitars, Rote, Lyres, Citterns, Scheitholts, Zithers, Psalteries. *Struck Strings*: Dulcimers, Keyed Cither, Tambourin à cordes.

- West Wall. *Bowed Strings*: Monochords, Tricord, Tetracord, Crwth, Viols, Violes d'Amour, Viola Pomposa, Tenor Geige, Violins, Violin Horn, Rebecs (Lyra), Pochettes, Cane Violins, Bowed Zithers, Vielles.
- East Wall. EGYPTIAN TYPE CASE. To the right, WIND INSTRUMENTS. *Whistles*: Vertical Flutes, Kaval, Fiscardella, Floyera, Pistalca, Pito, Jester's Flute, Flûtes Douces, Galoubets, Recorders, Flageolets, Cane Flutes, Flute Polyphonique, Double and Triple Flute à bec, Tuning Pipes, Pitch Pipe, Ocarinas, Transverse Flutes. *Single Beating Reeds*: Pibgorn, Chalumeau, Clarinet, Saxophone. Free Reeds, (Case 63a): Accordions, Melophone, Concertina.
- South Wall. *Double Beating Reeds*: Reed Pipes, Hautbois de Poitou, Schalmey, Floyera, Piffaro, Oboes, Cor Anglais, Bassoons, Sourdine, Wurst Fagott (Racket or Cervelas), Krumhorn, Tournebout, Auloi, Tibia (Monaulos, Plagiaulos), Pommers; *Single and Double Beating Reeds* with air reservoir: Bagpipes, Musettes.
- Central Case. *Strings*: Harps. *Wind*: Free Reeds,—Melodeons, Seraphine, Harmoniphon, Harmoniflute; Organs.

GALLERY 35.

EUROPEAN INSTRUMENTS—Continued.

- South Wall. WIND INSTRUMENTS. *Cup Mouthpieces*: Cornetti, Bass Horns, Ophecleides, Alpine Horns.
- East Wall. *Cup Mouthpieces*: Roman Bucina, Hunting Horns, French Horns, Russian Horns.
- North Wall. Trumpets, Roman Lituus, Trombones, Bugles, Valved Horns, Helicons.
- West Wall. VIBRATING MEMBRANES. Drums, Tambourines, Onion Flute.
- SONOROUS SUBSTANCES. Castanets, Schellenbaum, Glockenspiel, Nail Violin (Nagelgeige), Triangle, Bells.
- Corner Case. Musical Manuscripts.
- Central Case. Keyboards. *Plucked Strings*: Spinet and Harpsichord, with their prototype the Psaltery.
- Struck Strings*: Clavichord and Pianoforte, with their prototype the Dulcimer.
- Central Case. Sonorous Substances: Piano Harmonica, Glockenspiel Glassichord.
- Revolving Frame. Portraits of Musicians.
- Chronological Charts.

GALLERY 39.

PREHISTORIC INSTRUMENTS ; KINDRED INSTRUMENTS ; CONSTRUCTION CASES ; PIANO DEVELOPMENT.

- West Wall.** Corner Case. Prehistoric Instruments.
 Drawings which illustrate the distribution of instruments from the earliest times to the 13th Century, A.D. In studying this exhibit the student should start with Egypt and Assyria, these two countries representing the earliest civilization. The drawings to the right of this division show the distribution of instruments in the East through India and China to America; to the left, their distribution in the West through Greece. The Classification is indicated at the left of each section and is the same as that of the European instruments,—String, Wind, Vibrating Membranes and Sonorous Substances.
- North Wall.** Kindred Instruments, arranged according to the European classification. In each case the European Type is outlined with yellow cord, and around this central type are grouped instruments of the same class found in different countries.
- East Wall.** Kindred Instruments—continued. Construction Cases: Violin, Flute, Cornet.
- South Wall.** Construction Cases—continued. Organ and Piano Actions. Prototypes of the Piano: Monochord, Dulcimer, Hurdy Gurdy, Clavichord (Case 132). Early American Pianofortes.
- Central Case.** Series showing the development of the Pianoforte from the Cristofori Piano to c. 1850. Harpsichord believed to have been the property of Pope Innocent X. (1644-1656), and other keyboard instruments.



KISSAR; CENTRAL AFRICA.

I PREHISTORIC INSTRUMENTS.



PREHISTORIC INSTRUMENTS.
Case A. Page 4.

I.

PREHISTORIC INSTRUMENTS.

INTRODUCTORY NOTE.

The instruments shown in this exhibit represent the earliest musical remains which have been preserved to us. They consist of the primitive whistles of bone found in the caves of France and in other similar places where the remains of prehistoric man have been discovered. To obtain originals of these rare specimens was, of course, out of the question; but, through the courtesy of the directors of foreign Museums, reproductions of the more important European specimens have been obtained, and it is hoped that in this way the collection may eventually be made more complete. In cases where it has been impossible to procure reproductions, photographs¹ of the original have been added.

In a few cases, original specimens later in date but similar in type have been added. Such, for example, are the primitive bone flutes (No. 586) found in the mounds at Santa Catalina (California), and Nos. 3425, 3399, 3400, from South America.² Bone flutes are still in use among the North American Indians (No. 2059, Case 120), and in Tibet (Gallery 38, Case 1, Nos. 108, 1695) and India (Gallery 38, Case 18, No. 1445), where they are used in temple worship.

¹ Les Eyzies and La Madelaine, Dordogne, France. Originals in the British Museum.

² See also Gallery 35, Case 91, No. 2372, and Case 92a, No. 2729.

CATALOGUE
OF
PREHISTORIC INSTRUMENTS
CASE A.

3446. WHISTLE FLUTE. Made from the antler of a reindeer. Three holes and a beaked mouthpiece. France.

Length, $10\frac{1}{4}$ inches.

Reproduction in plaster from a cast in the Royal Conservatory of Music, Brussels. Original excavated at Poitiers, France.¹

Presented by M. Victor Charles Mahillon.

3399. VERTICAL FLUTE. Made from the tibia of a llama. Polished surface. Four holes in front and one at the back. Peru, South America.

Length, $9\frac{1}{8}$ inches.

586. DOUBLE WHISTLE. Made from the tibia of a deer. Two bones, with a single hole in the smaller end of each, forming a whistle. The bones darkened with age and crumbling on the edges. Santa Catalina, Southern California.

Length, 9 inches.

Presented by the American Museum of Natural History.

This specimen is one of eight found in the ancient Indian graves of Southern California. Numerous examples of single whistles have been found, but the double ones are much more rare. Further information in regard to the above specimen will be found in Prof. F. W. Putnam's "Report upon the Archæology of California," Vol. VII. of the U. S. Geographical Surveys West of 100th Meridian, under charge of Lieut. Wheeler, U. S. Army, Published by the Government, 1879, p. 237.

1989. WHISTLE. Made from a bone, the surface worn by age. No holes. Found in an ancient Indian grave at Santa Barbara, California.

Length, $8\frac{1}{4}$ inches.

3425. VERTICAL FLUTE. Made from cane or bamboo. Seven holes in front. Badly cracked. Cuzco, Peru, South America.

Length, $9\frac{1}{2}$ inches.

Presented by the American Museum of Natural History, New York.

¹ "Musical Instruments," Carl Engel, p. 9. "Catalogue. . . . Conservatoire Royal de Musique de Bruxelles," V. C. Mahillon, vol. i., No. 429, p. 437. "Histoire de la Musique," F. J. Fetis, vol. i., p. 25.



A



B



C



D

PREHISTORIC WHISTLES.

a. No. 3438

c. No. 3436

b. No. 3435

d. No. 3437

3470. WHISTLE FLUTE. Aztec pottery. A tube of brownish clay, slightly serpentine in form, with three holes in front and a flattened mouthpiece. Coatlinchen, District of Texcoco, Mexico.

Length, $5\frac{1}{4}$ inches.

The Aztec name for the whistle flute is Tlanquiquitli; the Spanish name Pito.

3469. WHISTLE FLUTE. Aztec pottery. A fragment of brown glazed tube, with a flattened mouthpiece and two holes directly below the whistle. Three red lines form the only decoration.

Length, $7\frac{3}{4}$ inches.

3400. VERTICAL FLUTE. Made from the ulna of a deer. Polished surface. Three holes in front.

Length, $4\frac{1}{2}$ inches.

3424. VERTICAL FLUTE. Made from the ulna of a deer. Darkened with age. Six holes in front in groups of two; one hole $\frac{1}{2}$ -inch from the top on one side, two holes on the opposite side, and two holes at the back $1\frac{1}{4}$ inches from the bottom. From the vicinity of Lima, Peru, South America.

Length, $4\frac{1}{4}$ inches.

Presented by the American Museum of Natural History, New York.

3435. WHISTLE. Made from the phalange of a reindeer. From the caves at Aurignac, France. Reproduction in plaster from the originals in the St. Germain Museum, Paris.¹

Length, $1\frac{7}{8}$ inches.

3436. WHISTLE. Similar to preceding. From the caves at Solutre, France. Reproduction in plaster from original in the St. Germain Museum, Paris.

Length, $1\frac{7}{8}$ inches.

3437. WHISTLE. Similar to preceding. From the caves at Laugerie-Basse, France. Reproduction in plaster from the original in the St. Germain Museum, Paris, France.

Length, $1\frac{3}{4}$ inches.

3438. WHISTLE. Similar to preceding. From the caves at Bruniquel, France. Reproduction in plaster from original at the St. Germain Museum, Paris, France.

Length, $1\frac{3}{4}$ inches.

¹ Reproductions Nos. 3435, 3436, 3437, 3438, procured through the courtesy of Prof. F. W. Putnam, of Cambridge, Mass.

2376. WHISTLE. Brown pottery. A grotesque figure, with a broad, flat head. Three holes in front, one on either side. Costa Rica, Central America.
Length, 4 inches. Width, $2\frac{3}{4}$ inches.
2787. WHISTLE. Dark brown pottery, in the form of a grotesque figure, showing the teeth. Surface decorated with incised lines and circles. Badly broken. San José, Central America.
Length, 4 inches. Width, 3 inches.
678. WHISTLE. Pottery tubing bent in triangular form, with a bulb at two corners, a head at the third. One of the three sides in the form of a grotesque animal. Central America.
Length of sides, $3\frac{1}{2}$ inches.
2383. WHISTLE. Pottery in the form of a bird, painted with dark lines. Costa Rica, Central America.
Length, $1\frac{3}{4}$ inches.
2547. WHISTLE. Pottery in the form of a turtle, painted with brown and pink lines, crossed lines on the back. Four holes. San José, Central America.
Length, 3 inches.
3432. WHISTLE. Pottery in the form of an animal, decorated with yellow spots. One hole in centre of back. From the coast of Peru, South America.
Length, $3\frac{3}{4}$ inches. Height, $2\frac{1}{4}$ inches.
Presented by the American Museum of Natural History, New York.
3433. WHISTLE. Reddish brown pottery in the form of a covered bowl; a small handle on one side, a hole in the top. Cuzco, Peru, South America.
Diameter, $1\frac{7}{8}$ inches.
Presented by the American Museum of Natural History, New York.
2381. WHISTLE. Reddish brown pottery in the form of a seated figure. Costa Rica, Central America.
Length, 2 inches.
2382. WHISTLE. Grey pottery, egg-shaped with whistle head; the surface decorated with incised parallel lines and bands. Costa Rica, Central America.
Length, $2\frac{1}{4}$ inches.
3169. WHISTLE. Brown pottery in the form of a grotesque bird. Four holes. Costa Rica, Central America.
Length, $1\frac{3}{4}$ inches.

3431. WHISTLE. Brown pottery in the form of a bird. From the coast of Peru in the vicinity of Lima, South America. Length, 3 inches.
Presented by the American Museum of Natural History, New York.
3430. WHISTLE. Pottery. A small tube flattened at one end and pierced with a single hole. Probably worn about the neck. From the coast of Peru in the vicinity of Lima, South America. Length, $2\frac{1}{4}$ inches.
2384. WHISTLE. Dark grey pottery in the form of a bird's head. Four holes. Costa Rica, Central America. Length, $1\frac{1}{2}$ inches.
3473. FRAGMENT OF FLUTE. Aztec pottery, unglazed. A fragment of tubing finished in the form of a human head with protruding eyes and large nose; ornamental head-dress. San Diego, District of Texcoco, Mexico. Length, 2 inches.
2119. SYRINX. Huayra-puhura. Eight pipes of greenish stone. Four of these pipes have lateral finger-holes, which when closed lower the pitch a semitone. These holes are on the second, fourth, sixth, and seventh pipes. Reproduction in plaster from a cast in the Berlin Museum. Original found in a Peruvian tomb, South America.¹
Height, $5\frac{3}{8}$ inches. Width, $6\frac{1}{4}$ inches.
Procured through the courtesy of the American Museum of Natural History, New York.
1957. WHISTLING JAR. Pottery. A double vase of painted ware, the flattened sides decorated with geometric bands, a grotesque bird in the centre of each; the two connected by a short tube. Peru, South America.
Height, 6 inches. Width, $6\frac{1}{4}$ inches.²
1285. TRUMPET. Cqueppa. A conical tube of red clay with one turn. Truxillo, Peru, South America. Length, $8\frac{3}{4}$ inches.³
Presented by the American Museum of Natural History, New York.

¹ "Musical Instruments in the South Kensington Museum," Carl Engel, pp. 69-71. Also, "Musical Instruments," by same author, p. 66.

² See "Report of National Museum," Washington, 1896: "Prehistoric Art," by Thomas Wilson, p. 653 ff.

³ "The Musical Instruments of the Incas," Charles W. Mead, p. 25.

3429. BELL. Copper. A slender neck expanding into a flat bell. Clapper missing. Entire surface corroded. Sicasica, Bolivia, South America.
Height, $1\frac{1}{4}$ inches.
Presented by the American Museum of Natural History, New York.
3428. BELL. Copper. Bean-shaped body, with an eyelet at the top, a narrow opening around the lower edge. Surface corroded. Island of Titicaca, South America.
Length, 1 inch.
Presented by the American Museum of Natural History, New York.
642. BELL. Tzilinilli. Copper. Small pear-shaped bell. Surface corroded. Mexico.
Length, $1\frac{3}{4}$ inches.
2050. BELL. Fragment of copper bell. Surface corroded. Peru, South America.
Dimensions, $2 \times 2\frac{1}{2}$ inches.
1952. BELL. Made from copper wire in pear-shaped form, with a flat top. Similar to No. 642. Mexico.
Length, 2 inches.
3462. RATTLE. Aztec pottery. A grotesque seated figure, with broad, flat head and prominent nose. Top of head broken. Tuxtepec, District of Oaxaca, Mexico.
Height, $3\frac{3}{4}$ inches. Width at base, $2\frac{1}{2}$ inches; head, $2\frac{1}{8}$ inches.
3461. RATTLE. Aztec pottery. A grotesque standing figure, with broad, flat head, with openings for eyes and mouth. Valley of Oaxaca, Mexico.
Height, 5 inches. Width of head, $2\frac{5}{8}$ inches; base, $1\frac{5}{8}$ inches.
3427. RATTLE. Made from a gourd, a hole pierced on one side, the dried seeds forming the rattle. Surco, Peru, South America.
Diameter, $4\frac{1}{4}$ inches.
Presented by the American Museum of Natural History, New York.
3426. RATTLE. Seeds of the laurel tree, strung on a cord of vegetable fibre. Used in the dance. Surco, Peru, South America.
Diameter of seeds, $\frac{1}{2} \times \frac{3}{4}$ inches.
Presented by the American Museum of Natural History, New York.

II. DRAWINGS

**ILLUSTRATING THE DISTRIBUTION OF
MUSICAL INSTRUMENTS**

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**CHART SHOWING ARRANGEMENT
AND CLASSIFICATION**

II.

DRAWINGS

— RATING THE DISTRIBUTION AND USE OF THE LEADING
— PIES OF MUSICAL INSTRUMENTS FROM THE EARLIEST
TIMES TO THE 13TH CENTURY A.D.

INTRODUCTORY NOTE.

se drawings, which cover a period from the earliest
to the 13th Century A.D., illustrate the distribution of
musical instruments during the early stages of their develop-

In the arrangement of this exhibit, Egypt and Assyria
p 3), as representing the earliest civilization, have been
ed as a starting-point. The drawings to the right of this
on show the distribution of the different classes of in-
ments in the East, through India and China to America;
on the left, in the West, through Greece to Western
pe. By this means the idea suggested in the Egyptian

Case has been carried out in detail, and the history of
our classes of instruments there represented is here fol-
l through the different countries. The classification
ng, Wind, Vibrating Membranes, and Sonorous Sub-
es) is indicated at the left of each section, while the geo-
hical divisions are shown at the top. The individual draw-
in the various groups read from left to right.

ie illustrations used have been taken in every case from
ant sources; either sculpture, bas-reliefs, or ancient manu-
pts. A list of the works in which they are to be found is
n below.

— & CASANOWICZ. "Biblical Antiquities." Smithsonian In-
stitution, U. S. National Museum Report. 1896.

—, E. H. "Violin Making." Ward & Lock, London. 1884.

These books are in the Library of the Museum.

- AMIoT, PÈRE. "Mémoire sur la Musique des Chinois." Nyon l'ainé, Paris. 1779.
- BIRDWOOD, GEORGE C. M. "The Industrial Arts of India." South Kensington Art Handbooks. Two vols. Chapman & Hall, London. 1880.
- BONANNI, P. FILIPPO. "Descrizione degl' Istromenti Armonici." Two vols. Pietro Paolo Montagnani-Mirabili, Roma. MDCCCVI.
- BUHLE, EDWARD. "Die musikalischen Instrumente in den Miniaturen des frühen Mittelalters." Breitkopf & Härtel, Leipzig. 1903.
- BUNTING, EDWARD. "Ancient Music of Ireland." Hodges & Smith, London. 1839.
- CESNOLA, LOUIS PALMA DI. "Cyprus: Its Ancient Cities, Tombs, and Temples. Third edition. Harper & Brothers, New York. 1878.
- CHAPPELL, W. "The History of Music." Chappell & Co. London. n.d.
- CHEYNE, T. K. "Encyclopædia Biblica." The Macmillan Co., New York. 1902.
- CHOUQUET, GUSTAVE. "Le Musée du Conservatoire National de Musique: Catalogue." Firmin-Didot, Paris. 1875.
- DALYELL, JOHN GRAHAM. "Musical Memoirs of Scotland." Thomas G. Stevenson, Edinburgh. 1849.
- DAY, C. R. "The Music and Musical Instruments of Southern India. Novello, Ewer & Co., London and New York. 1891.
- DENNIS, GEORGE. "The Cities and Cemeteries of Etruria." Third edition. Two vols. John Murray, London. 1883.
- ENGEL, CARL. "The Music of the Most Ancient Nations." T. Murray, London. 1864.
- "A Descriptive Catalogue of the Musical Instruments in the South Kensington Museum." Eyre & Spottiswoode, London. 1874.
- "Researches into the Early History of the Violin Family." Novello, Ewer & Co., London. 1883.

- FERGUSSON, JAMES. "Tree and Serpent Worship." . . . Second edition. William H. Allen & Co., London. 1873.
- GRILLET, LAURENT. "Les Ancêtres du Violon." Two vols. Charles Schmid, Paris. 1901.
- JOHNSTONE, JOHN. "A Journey from India to England." Longman & Co., London. 1818.
- KING, EDWARD. "Munimenta Antiqua." Four vols. G. Nicol, London. 1799-1805.
- LYON, G. F. "A Narrative of Travels in Northern Africa." John Murray, London. 1821.
- MAHILLON, VICTOR CHARLES. *Catalogue Descriptif et Analytique du Musée Instrumental du Conservatoire Royal de Musique de Bruxelles.* Ad. Hoste, Gand. 1893-1900.
- MEAD, CHARLES W. "The Musical Instruments of the Incas." Supplement to the *American Museum Journal*, vol. iii., No. 4. 1903.
- NAUMANN, EMIL. "The History of Music." Tr. by F. Praeger. Ed. F. A. Gore Ouseley. Cassell & Co., London. n.d.
- PIGGOTT, F. T. "The Music and Musical Instruments of Japan." B. T. Batsford, London. 1893.
- PORTER ROBERT KER. "Travels in Georgia, Persia." . . . Two vols. Longman & Co., London. 1821.
- RIANO, JUAN F. "Early Spanish Music." B. Quaritch, London. 1887.
- SMITH, HERMANN. "The World's Earliest Music." William Reeves, London. n.d.
- SMITH, WILLIAM. "A Dictionary of Greek and Roman Antiquities." Third edition. Two vols. John Murray, London. 1890-91.
- STAINER, JOHN. "The Music of the Bible." Cassell, Petter & Galpin, London. n.d.
- STRUTT, JOSEPH. "The Sports and Pastimes of the People of England." T. T. & J. Tegg, London. 1833.
- VAN AALST, J. A. "Chinese Music." Statistical Department of the Inspectorate-General of Customs, Shanghai. 1884.

CATALOGUE OF DRAWINGS.

The order of the groups of drawings in Cases 110-112 is from left to right; i.e., 1. Western Europe, 2. Greece, 3. Egypt. As Egypt should be taken as a starting-point, the arrangement in the catalogue begins in each Class and Type with that country; i.e., Harp Type, Group 3, Egypt, is followed by Groups 2 and 1, showing the Western distribution of instruments, and these in turn are followed by Groups 4, 5, 6, 7, 8, which show the Eastern distribution; Lute Type, Group 11, Westward, Groups 10 and 9; Eastward, Groups 12, 13, 14, 15, 16; and in each Type the same order should be followed.

CLASS I. STRINGED INSTRUMENTS.

SECTION A. PLUCKED STRINGS.

HARP TYPE.

CASE 110.

EGYPT.

Group 3. EGYPT.

Our knowledge of the musical instruments of Egypt is derived from a variety of representations of them in sculptures and old paintings, as well as from fragments, and even nearly perfectly preserved specimens, of harps, lyres, and other stringed instruments, pipes, flutes, etc., discovered in tombs. Further illustrations will be found in Adolf Erman's "Life in Ancient Egypt," translated by H. M. Tirard (London and New York, Macmillan & Co., 1894), p. 249, ff.

- a. EGYPTIAN HARP. Stainer, "Music," p. 34.¹
- b. EGYPTIAN HARP. Engel, "Music," p. 182.
- c. EGYPTIAN HARP. *Id.*, p. 190.
- d. EGYPTIAN HARP. Stainer, "Music," p. 31.
- e. EGYPTIAN HARP. Engel, "Music," p. 195.

From a fresco on the wall of an ancient sepulchre at Thebes, supposed to be the tomb of Rameses III., who reigned about 1250 B.C. Native name, *Buni*.

¹ For the fuller titles of the books quoted or mentioned as authorities, see the list appended to the Introductory note, p. 11.



HARP.
Ancient Egypt.
Page 14. Group 3 c.

WESTWARD.**Group 2. GREECE, including Etruscan and Græco-Roman Art.**

- a. HARP. From a Greek vase in the Munich Museum, dating from time of Alexander the Great, 356-323 B.C. Very rare and probably Asiatic. Engel, "Catalogue," p. 35.

Group 1. WESTERN EUROPE.

This type is characteristic of the Northern districts and the Celtic nations: probably derived direct from Western Asia.

- a. HARP. From sculptured cross at the old church of Ullard, County of Kilkenny, Ireland. c. 700 A.D. Engel, "Music," p. 95.
- b. HARP. Sculptured figure on Dupplin Cross in Perthshire, Scotland, called the "Standing Stone of Bankhead." 10th Century. Dalyell, "Memoirs," pl. 37.
- c. HARP. King David, from an Anglo-Saxon manuscript of the 11th Century, in the British Museum. Engel, "Catalogue," p. 94.
- d. HARP. From a bas-relief in the Abbey of St. Georges de Boscherville, Normandy. 11th Century. *Id.*, p. 113.
- e. HARP. From a manuscript of the 12th Century at Strassburg. Grillet, "Ancêtres," p. 26.
- f. HARP. From an early illuminated manuscript of Cambrensis. 13th Century. Bunting, "Ancient Music," p. 37.

EASTWARD.**Group 4. ASSYRIA.**

- a. ASSYRIAN HARP. Engel, "Music," p. 29.
- b. ASSYRIAN HARP. *Id.*, p. 31.
- c. BABYLONIAN HARP. "Encyclopædia Biblica," Fig. 21.
- d. ASSYRIAN HARP. (Trigonon.) Engel, "Catalogue," p. 23.

Group 5. PERSIA and ARABIA.

- a. PERSIAN HARP. Porter, "Travels," vol. ii., pl. 63. Native name, *Chang*.
- b. PERSIAN HARP. Engel, "Catalogue," p. 59.

Khosroo Purviz, monarch of Persia in the 6th Century A.D., caused two lofty and deep arches to be executed in the rock of a mountain near the town of Kermanshah, in Persia, as a palace for himself and his queen. These caverns were decorated with bas-reliefs commemorating his reign, and the drawings here shown are taken from illustrations of these bas-reliefs in Sir Robert Porter's "Travels in Georgia, Persia, etc."

Group 6. INDIA.

- a. HARP. From bas-relief on western gateway of Sanchi Tope, Central India. Fergusson, "Tree," pl. 24.
- b. HARP. From bas-relief on rail of outer enclosure at Amravati, in Central India. *Id.*, pl. 62.

The Topes of Sanchi and Amravati, in Central India, were large Buddhist monuments or relic-shrines, erected between 250 B.C. and 500 A.D. They were surrounded by stone railings, and upon these railings, or their gateposts, were carved many small figures illustrating Buddhist legends, etc., which are beautiful specimens of the art of that religion. The drawings here shown are from these sculptures as depicted in Fergusson's "Tree and Serpent Worship." The curly haired and warmly clad figures in groups 29, 77, 101, and 125 were, no doubt, captives from the colder country to the northwest of India—Afghanistan. In the sculptures, they are all represented with musical instruments.

Group 7. EASTERN ASIA.¹Group 8. AMERICA.¹**LYRE TYPE.****EGYPT.**

Group 11. EGYPT.

- a. EGYPTIAN LYRE. Engel, "Catalogue," p. 14.
- b. EGYPTIAN LYRE. *Id.*, p. 15.

WESTWARD.

Group 10. GREECE, including Etruscan and Græco-Roman Art.

- a. LYRE. From the Agrigentine vase, in the Munich Museum. 580 B.C. Naumann, "History," vol. i., p. 131.
- b. LYRE. From a copper bowl found in a tomb on the Island of Cyprus, Græco-Phœnician period, 600-300 B.C. Cesnola, "Cyprus," p. 77.
- c. LYRE. From a Greek vase, about 350 B.C. Engel, "Catalogue," p. 35.
- d. LYRE. From an ancient Greek monument. Naumann, "History," p. 130.
- e. LYRE. From a painting found in Herculaneum. Engel, "Catalogue," Chappell, "History," p. 308.
- f. TRIGONUM. From Herculaneum. Engel, "Catalogue," p. 42.
- g. LYRE. From interior of an Etruscan tomb. c. 400 B.C. Dennis, "Cities," vol. i., p. 319.
- h. LYRE. From an Etruscan Amphora. c. 300 B.C. Dennis, "Cities," vol. i., p. 467.

¹ No ancient examples known.

Group 9. WESTERN EUROPE.

- a. ROTE. From Anglo-Saxon manuscript in the British Museum. 7th Century. Engel, "Researches," p. 53.

The Rote: characteristic of the Northern districts, and probably introduced through the Roman lyre.

- b. CRWTH. From a French manuscript of the 11th Century. *Id.*, p. 43.

The Crwth: finger-board and bow added after the introduction of the Viol type into the Southern districts. (See Viol Type, p. 50).

- c. ROTE. From a German manuscript of the 9th Century. *Id.*, p. 55.

- d. CRWTH. From bas-relief on the choir in Worcester Cathedral. 13th Century. *Id.*, p. 41.

EASTWARD.

Group 12. ASSYRIA.

- a. ASSYRIAN LYRE. Engel, "Music," p. 38.

- b. ASSYRIAN LYRE. From slab excavated at Khorsabad. *Id.*, p. 38.

- c. ASSYRIAN LYRE. Played by Semitic captive. *Id.*, p. 39.

"Our acquaintance with the Assyrian instruments has been derived almost entirely from the famous bas-reliefs which have been excavated from the mounds of Nimrud, Khorsabad, and Kouyunjik, situated near the river Tigris, in Asiatic Turkey."—Engel.

Group 13. PERSIA and ARABIA.¹Group 14. INDIA.¹Group 15. EASTERN ASIA.¹Group 16. AMERICA.¹

LUTE TYPE.

EGYPT.

Group 19. EGYPT.

- a. EGYPTIAN LUTE. Engel, "Music," p. 204.

- b. EGYPTIAN LUTE. *Ibid.*

- c. EGYPTIAN LUTE. *Ibid.*

- d. EGYPTIAN LUTE. Hittite lute player from bas-relief found in Asia Minor. Adler & Casanowicz, "Antiquities," pl. 8. The Hittites were conquered by the Egyptians.

¹ No ancient examples known.

WESTWARD.**Group 18. GREECE, including Etruscan and Græco-Roman Art.**

- a. PANDURA. From a photograph of statue in the National Museum at Athens. 370 B.C. Very rare. Egyptian or Asiatic.

Group 17. WESTERN EUROPE.

This type was characteristic of the Southern districts and due to Moorish and Arabian influence. Afterwards generally distributed.

- a. LUTE. From a manuscript of the 11th Century. Riano, "Early Spanish Music," p. 109.
- b. LUTE. From the Codex of the Cantigas de Santa Maria. 13th Century. *Id.*, p. 113.
- c. LUTE. *Id.*, p. 113.
- d. LUTE. *Id.*, p. 115.
- e. LUTE. *Id.*, p. 116.
- f. LUTE. *Id.*, p. 117.

The Codex of the Cantigas de Santa Maria is a manuscript of the 13th Century, consisting of four hundred and one religious poems, accompanied by music. Of the three copies of this work which are in existence, one, in the library of the Escorial, Spain, is illustrated by vignettes of fifty-one musicians playing on musical instruments.

EASTWARD.**Group 20. ASSYRIA.**

- a. ASSYRIAN LUTE. Engel, "Music," p. 54.

Group 21. PERSIA and ARABIA.

- a. PERSIAN LUTE (*El Oud*). Engel, "Catalogue," p. 61.
- b. ARABIAN LUTE. Riano, "Early Spanish Music," p. 113.
- c. ARABIAN LUTE. Bonanni, "Istromenti Armonici," pl. 57.
- d. PERSIAN LUTE. Mahillon, "Catalogue," vol. ii., p. 156.
- e. ARABIAN LUTE (*El Oud*). *Id.*, vol. i., p. 417.

Group 22. INDIA.

- a. LUTE. From bas-relief on rail of outer enclosure Amravati Tope, Central India. Fergusson, "Tree," pl. 74. (See note, Group 6.)
- b. LUTE (*Vina*). Naumann, "History," vol. i., p. 20.
- c. LUTE (*Sitar*). Day, "Music," p. 138.
- d. LUTE (*Sitar*). *Id.*, p. xviii.

Group 23. EASTERN ASIA.

- a. MOON GUITAR (*Yueh Ch'in*), Chinese. Van Aalst, "Chinese Music," p. 36.
- b. JAPANESE LUTE (*Bi'wa*). Piggott, "Music of Japan," pl. 4.
- c. CHINESE LUTE (*P'i-p'a*). Van Aalst, "Chinese Music," p. 36.
- d. CHINESE LUTE (*San-heen*). Engel, "Catalogue," p. 181.

Group 24. AMERICA.¹

PSALTERY AND DULCIMER TYPE.

EGYPT.

Group 27. EGYPT.¹

WESTWARD.

Group 26. GREECE,¹ including Etruscan and Græco-Roman Art.

Group 25. WESTERN EUROPE.

This type was characteristic of the Southern districts, and due to Arabic influence.

- a. PSALTERY. From the Codex of the Cantigas de Santa Maria. 13th Century. Riano, "Early Spanish Music," p. 112. (See note, Group 17.)
- b. PSALTERY. *Id.*, p. 112.
- c. PSALTERY. *Id.*, p. 117.
- d. PSALTERY. *Id.*, p. 117.
- e. PSALTERY. *Id.*, p. 118.
- f. PSALTERY. From a bas-relief in the Abbey of St. Georges de Boscherville, Normandy. 11th Century. Engel, "Catalogue," p. 113.

EASTWARD.

Group 28. ASSYRIA.

- a. ASSYRIAN DULCIMER. Engel, "Music," p. 44.

"The strings of this dulcimer must have lain parallel to each other, strung horizontally over a flat, dish-shaped sound body. The Assyrian artist could not represent this properly, owing to his ignorance of the laws of perspective."—*Ency. Biblica*.

¹ No ancient example known.

Group 29. PERSIA and ARABIA.

- a. AFGHAN PSALTERY. Fergusson, "Tree," p. 28.
- b. PERSIAN DULCIMER. Porter, "Travels," vol. ii., pl. 64.
(See note, Group 5.)
- c. PERSIAN DULCIMER (*Santir*). From a Persian painting in Teheran. Engel, "Catalogue," p. 62.
- d. PERSIAN PSALTERY (*Kanoon*). *Id.*, p. 61.

Group 30. INDIA.¹

Group 31. EASTERN ASIA.

- a. CHINESE PSALTERY. (*Se*). Amiot, "Mémoires," vol. vi., pl. 28.
- b. CHINESE PSALTERY (*Ch'in*). Van Aalst, "Chinese Music," p. 61.
- c. JAPANESE PSALTERY (*Taki-goto*). Engel, "Catalogue," p. 196.

"As regards the invention of musical instruments, the Chinese have several traditions, . . . and there is no doubt that they possessed, long before our Christian era, several of their popular instruments to which they attribute a fabulously high antiquity."—*Engel*.

Group 32. AMERICA.¹

VIOL TYPE.

EGYPT.

Group 35. EGYPT.¹

WESTWARD.

Group 34. GREECE,¹ including Etruscan and Græco-Roman Art.

Group 33. WESTERN EUROPE.

This type was first characteristic of Southern districts, then generally distributed. Introduced by the Moors.

- a. VIELLE. From bas-relief in the Abbey of St. Georges de Boscherville, Normandy. 11th Century. Engel, "Catalogue," p. 113.

¹ No ancient example known.

- b. ANGLO-SAXON FITHELE. From a manuscript of the 11th Century in the British Museum. Engel, "Researches," p. 118.
- c. VIOLA. From the Codex of the Cantigas de Santa Maria. 13th Century. Riano, "Early Spanish Music," p. 114. (See note, Group 17.)
- d. VIOLA. *Id.*, p. 117.
- e. VIELLE. From a French manuscript of the 13th Century. Naumann, "History," p. 246.
- f. VIELLE. From a window of the 13th Century in the Cathedral of Troyes. Print.

EASTWARD.

Group 36. ASSYRIA.¹

Group 37. PERSIA and ARABIA.

- a. PERSIAN FIDDLE (*Kemangeh*). Engel, "Researches," p. 87.
- b. PERSIAN FIDDLE (*Kemangeh*). Allen, "Violin," p. 40.
- c. ARABIAN FIDDLE (*Rebab*). *Id.*, p. 41.
- d. ARABIAN FIDDLE (*Kemangeh*). Mahillon, "Catalogue," vol. i., p. 417.

Group 38. INDIA.

- a. VIOLIN (*Sarinda*). Engel, "Researches," p. 17.

Group 39. EASTERN ASIA.

- a. CHINESE FIDDLE (*Erh h'sien*). Van Aalst, "Chinese Music," p. 36.
- b. JAPANESE FIDDLE (*Kokiu*). Engel, "Researches," p. 16.

Group 40. AMERICA.¹

WITH KEY OR SIMILAR MECHANISM.

EGYPT.

Group 43. EGYPT.¹

¹ No ancient example known.

WESTWARD.

Group 42. GREECE,¹ including Etruscan and Græco-Roman Art.

Group 41. WESTERN EUROPE.

- a. ORGANISTRUM. From bas-relief in the Abbey of St. Georges de Boscherville, Normandy. 11th Century. Engel, "Researches," p. 128.
- b. ORGANISTRUM. From sculptured figures, Santiago de Compostella, Spain. 12th Century. *Id.*, p. 130.
- c. SYMPHONIA. From Codex of the Cantigas de Santa Maria. 13th Century. Riano, "Early Spanish Music," p. 116. (See note, Group 17.)

EASTWARD.

Group 44. ASSYRIA.¹

Group 45. PERSIA and ARABIA.¹

Group 46. INDIA.¹

Group 47. EASTERN ASIA.¹

Group 48. AMERICA.¹

¹ No ancient example known.

CATALOGUE
OF
CLASS II. WIND INSTRUMENTS.

FLUTE TYPE.

A. Vertical Type.

CASE III.

EGYPT.

Group 51. EGYPT.

- a. EGYPTIAN FLUTE. Engel, "Catalogue," p. 118. Native name, *Scbi*.
- b. EGYPTIAN FLUTE. Engel, "Music," p. 214.
The long flute (*Scbat*) of the Old Empire was held obliquely behind the performer, and the short flute (*Mât*) was held horizontally when played. Eman, "Life in Ancient Egypt," p. 253.

WESTWARD.

Group 50. GREECE, including Etruscan and Græco-Roman Art.

- a. PANPIPE. From a relief on a marble sarcophagus in the Museum at Florence. Naumann, "History," p. 125.
- b. PANPIPE. From a relief in the Albani villa at Rome. *Id.*, p. 126.

Group 49. WESTERN EUROPE.

- a. PANPIPE. From a Psalter of the 9th Century, Antwerp. Buhle, "Musikalischen Instrumente," p. 10.
- b. VERTICAL FLUTE. From the Codex of the Cantigas de Santa Maria. 13th Century. Riano, "Early Spanish Music," p. 110. (See note, Group 17.)
- c. VERTICAL FLUTE. *Id.*, p. 111.

EASTWARD.

Group 52. ASSYRIA.¹

Group 53. PERSIA and ARABIA.

- a. PANPIPE. From bas-relief in a Persian cavern. 6th Century A.D. Porter, "Travels," vol. ii, pl. 64. (See note, Group 5.)
- b. PERSIAN FLUTE (*Nay*). Choquet, "Catalogue," p. 232.

¹ No ancient example known.

Group 54. INDIA.¹

Group 55. EASTERN ASIA.

- a. JAPANESE VERTICAL FLUTE. (*Shakuhachi*). Piggott, "Japan," pl. 5.
- b. CHINESE PANPIPES. Naumann, "History," vol. i., p. 17.
- c. CHINESE VERTICAL FLUTE (*Hsiao*). *Id.*

Group 56. AMERICA.

- a. PANPIPE. Terra-cotta water jar found in Peruvian tomb. Mead, "Incas," pl. 4.
- b. PANPIPE. *Ibid.*
- c. VERTICAL FLUTES. Decoration from an ancient Peruvian terra-cotta vessel. *Id.*, pl. i.
- d. PANPIPE. *Ibid.*

B. Transverse Type.

EGYPT.

Group 59. EGYPT.¹

WESTWARD.

Group 58. GREECE, including Etruscan and Græco-Roman Art.

- a. TRANSVERSE FLUTE. From a manuscript of the 12th Century, Smyrna. Buhle, "Musikalischen Instrumente," p. 11.

Group 57. WESTERN EUROPE.

- a. TRANSVERSE FLUTE. From a manuscript of the 11th Century, Strassburg. Buhle, "Musikalischen Instrumente," p. 11.
- b. TRANSVERSE FLUTE. From a manuscript of the 13th Century. Grillet, "Ancêtres," vol. i., p. 91.
- c. TRANSVERSE FLUTE. From the Codex of the Cantigas de Santa Maria. 13th Century. Riano, "Early Spanish Music," p. 118. (See note, Group 17.)

¹ No ancient example known.

EASTWARD.

Group 60. ASSYRIA.¹

Group 61. PERSIA and ARABIA.¹

Group 62. INDIA.

- a. TRANSVERSE FLUTE (*Murali*). Birdwood, "Industrial Arts," vol. i., pl. H.
- b. TRANSVERSE FLUTE. *Id.*, pl. G.
- c. TRANSVERSE FLUTE. From bas-relief on Eastern gateway of Sanchi Tope, Central India. Fergusson, "Tree," pl. 33. (See note, Group 6.)
- d. TRANSVERSE FLUTE. From bas-relief on rail of outer enclosure, Amravati Tope, Central India. 4th Century A.D. Fergusson, "Tree," pl. 33. (See note, Group 6.)

Group 63. EASTERN ASIA.

- a. CHINESE TRANSVERSE FLUTE (*Ti-tzu*). Van Aalst, "Chinese Music," p. 71.
- b. CHINESE TRANSVERSE FLUTE (*Ti-tzu*). Naumann, "History," vol. i., p. 17.
- c. JAPANESE TRANSVERSE FLUTE (*Fuye*). Piggott, "Japan," pl. 3.

Group 64. AMERICA.¹

REED TYPE.**A. Single Pipes.****EGYPT.**

Group 67. EGYPT.

- a. EGYPTIAN SINGLE PIPE. Engel, "Music," p. 218.

WESTWARD.

Group 66. GREECE, including Etruscan and Græco-Roman Art.

- a. SINGLE PIPE. Statue found in Villa of Antoninus Pius. c. 490 B.C. Smith, "Earliest Music," p. 134.

¹ No ancient example known.

Group 65. WESTERN EUROPE.

- a. **SINGLE PIPE.** From the Codex of the *Cantigas de Santa Maria*. Riano, "Early Spanish Music," p. 120. (See note, Group 17.)
- b. **SINGLE PIPE.** From the Codex of the *Cantigas de Santa Maria*. *Id.*, p. 110.
- c. **SINGLE PIPE.** From a manuscript of the 13th Century in Paris. Buhle, "Musikalischen Instrumente," pl. 12.

EASTWARD.

Group 68. ASSYRIA.

- a. **SINGLE PIPE.** From figure in baked clay discovered in ruins of Susa (ancient Assyrian city). Engel, "Music," p. 77.

Group 69. PERSIA and ARABIA.

- a. **PERSIAN SINGLE PIPE** (*Zourna*). Mahillon, "Catalogue," vol. ii., p. 162.
- b. **PERSIAN SINGLE PIPE** (*Zourna*). *Id.*, p. 156.

Group 70. INDIA.

- a. **SINGLE PIPE.** From bas-relief on rail of outer enclosure, Amravati Topc, Central India. 4th Century A.D. Fergusson, "Tree," pl. 62. (See note, Group 6.)
- b. **SINGLE PIPE.** From a native drawing. Day, "Music," p. 91.

Group 71. EASTERN ASIA.

- a. **JAPANESE SINGLE PIPE** (*Hitschiriki*). Piggott, "Japan," pl. 4.

Group 72. AMERICA.¹

B. Double Pipes.

EGYPT.

Group 75. EGYPT.

- a. **EGYPTIAN DOUBLE PIPE** (*Mam*). Engel, "Music," p. 216.
- b. **EGYPTIAN DOUBLE PIPE.** From a wall painting in a tomb at Thebes, c. 1600 B. C. Smith, "Earliest Music," p. 46.
- c. **EGYPTIAN DOUBLE PIPE.** *Id.*, p. 45.

¹No ancient example known.



DOUBLE PIPES.

Greece.

Page 27. Group 74 *f.*

WESTWARD.**Group 74. GREECE, including Etruscan and Græco-Roman Art.**

- a.* DOUBLE PIPE. From a copper bowl found in a tomb on the Island of Cyprus. Græco-Phœnician period, 600-300 B.C. Cesnola, "Cyprus," p. 77.
- b.* DOUBLE PIPE. Engel, "Catalogue," p. 39.
- c.* DOUBLE PIPE. From a relief on a marble sarcophagus in the Museum at Florence. Naumann, "History," p. 77.
- d.* DOUBLE PIPE. From a Roman Mosaic. Engel, "Catalogue," p. 44.
- e.* ROMAN DOUBLE PIPE. Smith's "Dictionary," vol. i., p. 357.
- f.* DOUBLE PIPE. From the wall of an Etruscan tomb, c. 400 B.C. Dennis, "Cities," vol. i., p. 301.

Group 73. WESTERN EUROPE.

- a.* DOUBLE PIPE. From the Codex of the Cantigas de Santa Maria. 13th Century. Riano, "Early Spanish Music," p. 111. (See note, Group 17.)
- b.* DOUBLE PIPE. From a manuscript of the 11th Century in Paris. Buhle, "Musikalischen Instrumente," pl. 9.
- c.* DOUBLE PIPE. From a manuscript of the 12th Century in Rome. *Id.*
- d.* DOUBLE PIPE. From a manuscript Psalter of the 10th Century, England. Strutt, "Sports," Fig. 51.

EASTWARD.**Group 76. ASSYRIA.**

- a.* ASSYRIAN DOUBLE PIPE. Engel, "Music," p. 58.

Group 77. PERSIA and ARABIA.

- a.* DOUBLE PIPE. From bas-relief on northern gateway of Sanchi Tope, Central India. Fergusson, "Tree," pl. 28. (See note, Group 6.)

Group 78. INDIA.¹**Group 79. EASTERN ASIA.¹****Group 80. AMERICA.¹**¹ No ancient example known.

C. Bagpipe.**EGYPT.**Group 83. EGYPT.¹**WESTWARD.**

Group 82. GREECE, including Etruscan and Græco-Roman Art.

- a. BAGPIPE. From a bronze figure of a Roman bagpiper dug up in the ancient Roman fortress at Richborough, Kent, England. This fortress was completed c. 205 A.D. King, "Munimenta Antiqua," vol. ii., pl. 20.

Group 81. WESTERN EUROPE.

- a. BAGPIPE. From Codex of the Cantigas de Santa Maria. 13th Century. Riano, "Early Spanish Music," p. 119. (See note, Group 17.)
- b. BAGPIPE. *Id.*, p. 121.
- c. BAGPIPE. *Id.*, p. 120.
- d. BAGPIPE. From a sculpture at Hull, Scotland. 13th Century. Dalyell, "Memoirs," pl. 8.
- e. BAGPIPE. From a manuscript in the Royal Library, England. 13th Century. Strutt, "Sports," Fig. 41.

EASTWARD.Group 84. ASSYRIA.¹

Group 85. PERSIA and ARABIA.

- a. BAGPIPE. From bas-relief in Persian cavern. 6th Century A. D. Porter, "Travels," vol. ii., pl. 64. (See note, Group 5.)

Group 86. INDIA.¹Group 87. EASTERN ASIA.¹Group 88. AMERICA.¹

¹No ancient example known.

D. Free Reed.**EGYPT.**

Group 91. EGYPT.¹

WESTWARD.

Group 90. GREECE,¹ including Etruscan and Græco-Roman Art.

Group 89. WESTERN EUROPE.¹

EASTWARD.

Group 92. ASSYRIA.¹

Group 93. PERSIA and ARABIA.¹

Group 94. INDIA.¹

Group 95. EASTERN ASIA.

a. CHINESE MOUTH ORGAN (*Chêng*). Naumann, "History," vol. i., p. 17.

b. JAPANESE MOUTH ORGAN (*Sho*). Piggott, "Japan," pl. 4.

Group 96. AMERICA.¹

HORN TYPE.**CASE 112.****EGYPT.**

Group 99. EGYPT.

a. EGYPTIAN TRUMPET. Engel, "Music," p. 217.

b. EGYPTIAN TRUMPET. *Id.*, p. 248.

WESTWARD.

Group 98. GREECE, including Etruscan and Græco-Roman Art.

a. HORN (*Bucina*). Detail of decoration from an ancient terracotta lamp.

b. TRUMPET and HORN (*Lituus* and *Cornu*). From the altar of Julius Victor.

c. ROMAN TRUMPET (*Tuba*). From an ancient vase.
From articles on *Tuba*, *Cornu*, and *Bucina*, Smith, "Dictionary."

¹ No ancient example known.

Group 97. WESTERN EUROPE.

- a. TRUMPETS. From the Codex of the Cantigas de Santa Maria. 13th Century. Riano, "Early Spanish Music," p. 112. (See note, Group 17.)
- b. HORN. From a manuscript of the 10th Century in the British Museum. Buhle, "Musikalischen Instrumente," pl. 2.
- c. HORN. From a manuscript of the 11th Century in Munich. *Id.*, pl. 3.
- d. TRUMPET. From a manuscript of the 9th Century in Paris. *Id.*, pl. 5.
- e. HORN. From a German manuscript of the 11th Century. *Id.*, pl. 6.

EASTWARD.

Group 100. ASSYRIA.

- a. ASSYRIAN TRUMPET. Engel, "Music," p. 61.

Group 101. PERSIA and ARABIA.

- a. AFGHAN TRUMPET. From bas-relief on northern gateway of Sanchi Tope, Central India. Fergusson, "Tree," pl. 28. (See note, Group 6.)
- b. PERSIAN TRUMPET. From bas-relief in Persian cavern. 6th Century A.D. Porter, "Travels," vol. ii., pl. 54. (See note, Group 5.)

Group 102. INDIA.

- a. CONCH (*Shunk*). From bas-relief on eastern gateway of Sanchi Tope, Central India. Fergusson, "Tree," pl. 33. (See note, Group 6.)
- b. TRUMPET. From bas-relief on rail of outer enclosure, Amravati Tope, Central India. 4th Century A.D. *Id.*; pl. 62. (See note, Group 6.)
- c. TRUMPET (*Panchama Ottu*). From a native drawing. Day, "Music," p. 91.
- d. TRUMPET (*Rana-Shringa*). Mahillon, "Catalogue," vol. i., p. 129.

Group 103. EASTERN ASIA.

- a. CHINESE HORN. Naumann, "History," vol. i., p. 33.
- b. CHINESE TRUMPETS. Bonanni, "Istromenti Armonici" pl. 15.

Group 104. AMERICA.

- a.* CONCH. Decoration from gold ornament found in ancient grave, Peru. Mead, "Incas," p. 24.
- b.* TRUMPET, *Id.*, p. 24.

WITH KEY OR SIMILAR MECHANISM.**EGYPT.****Group 107. EGYPT.¹****WESTWARD.****Group 106. GREECE, including Etruscan and Græco-Roman Art.**

- a.* ORGAN. Stainer, "Music," p. 107.

Group 105. WESTERN EUROPE.

- a.* ORGAN. From a German manuscript of the 11th Century. Buhle, "Musikalischen Instrumente," pl. 14.
- b.* ORGAN. From the Codex of the Cantigas de Santa Maria. 13th Century. Riano, "Early Spanish Music," p. 119. (See note, Group 17.)
- c.* ORGAN. From Belvoir Castle Psalterium. 13th Century. Buhle, "Musikalischen Instrumente," pl. 14.

EASTWARD.**Group 108. ASSYRIA.¹****Group 109. PERSIA and ARABIA.¹****Group 110. INDIA.¹****Group 111. EASTERN ASIA.¹****Group 112. AMERICA.¹**

¹ No ancient example known.

CATALOGUE
OF
CLASS III. VIBRATING MEMBRANES.

TAMBOURINE TYPE.

CASE 112.

EGYPT.

Group 115. EGYPT.

- a.* EGYPTIAN TAMBOURINE. Engel, "Music," p. 220.

WESTWARD.

Group 114. GREECE, including Etruscan and Græco-Roman Art.

- a.* TAMBOURINE (*Tympanum*). Naumann, "History," p. 127.
b. TAMBOURINE. From a copper bowl found in a tomb on the Island of Cyprus. Græco-Phœnician period, 600-300 B.C. Cesnola, "Cyprus," p. 77.

Group 113. WESTERN EUROPE.

- a.* TAMBOURINE. From a sculptured figure in Scotland. Dal-yell, "Memoirs," pl. 20.

EASTWARD.

Group 116. ASSYRIA.

- a.* ASSYRIAN TAMBOURINE. Engel, "Music," p. 73.

Group 117. PERSIA and ARABIA.¹

Group 118. INDIA.¹

Group 119. EASTERN ASIA.¹

Group 120. AMERICA.¹

DRUM TYPE.

EGYPT.

Group 123. EGYPT.

- a.* EGYPTIAN DRUM. Engel, "Music," p. 218.
b. EGYPTIAN DRUM. Stainer, "Music," p. 151.

¹No ancient example known.



TAMBOURINE.
Assyria.
Page 32. Group 116.

WESTWARD.

Group 122. GREECE,¹ including Etruscan and Græco-Roman Art.

Group 121. WESTERN EUROPE.

- a. DRUM. From a manuscript of the 11th Century in Madrid. Riano, "Early Spanish Music," p. 109.
- b. DRUM. From a sculptured figure in Scotland. Dalryell, "Memoirs," pl. 20.

EASTWARD.

Group 124. ASSYRIA.

- a. ASSYRIAN DRUM. Engel, "Music," p. 63.
- b. ASSYRIAN DRUM. *Id.*, p. 64.

Group 125. PERSIA and ARABIA.

- a. PERSIAN DRUM. From bas-relief in Persian cavern. 6th Century A.D. Porter, "Travels," vol. ii., pl. 64. (See note, Group 5.)
- b. AFGHAN DRUM. From bas-relief on northern gateway of Sanchi Tope, Central India. Fergusson, "Tree," pl. 28. (See note, Group 6.)
- c. PERSIAN DRUM. Bonanni, "Istromenti Armonici," pl. 83.
- d. PERSIAN DRUMS. *Id.*, pl. 133.
- e. ARABIAN DRUMS. Mahillon, "Catalogue," vol. i., p. 417.
- f. PERSIAN DRUM. *Id.*, vol. ii., p. 162.

Group 126. INDIA.

- a. DRUM. From bas-relief on northern gateway of Sanchi Tope, Central India. Fergusson, "Tree," pl. 34. (See note, Group 6.)
- b. DRUM. *Id.*, pl. 28.
- c. DRUM. From a native drawing. Day, "Music," pl. 91.
- d. DRUM. Mahillon, "Catalogue," vol. i., p. 129.

¹ No ancient example known.

Group 127. EASTERN ASIA.

- a. CHINESE RATTLE DRUM. Naumann, "History," vol i., p. 17.
- b. CHINESE KETTLE DRUM. *Id.*, vol. i., p. 17.
- c. CHINESE DRUM. *Id.*, vol. i., p. 16.
- d. JAPANESE TEMPLE DRUM. Piggott, "Japan," pl. 4.
- e. CHINESE DRUM. Said to have been invented 1122 B.C. for use at the Imperial palace. Naumann, "History," vol. i., p. 13.

Group 128. AMERICA.

- a. DRUM. Pottery vessel from ancient Peruvian grave. Mead, "Incas," pl. 2.
- b. DRUM. *Id.*, pl. 2.
- c. DRUM. Decoration from ancient Peruvian terra-cotta vessel. *Id.*, pl. 1.

CATALOGUE
OF
CLASS IV. SONOROUS SUBSTANCES.

CYMBAL AND BELL TYPE.

CASE 112.

EGYPT.

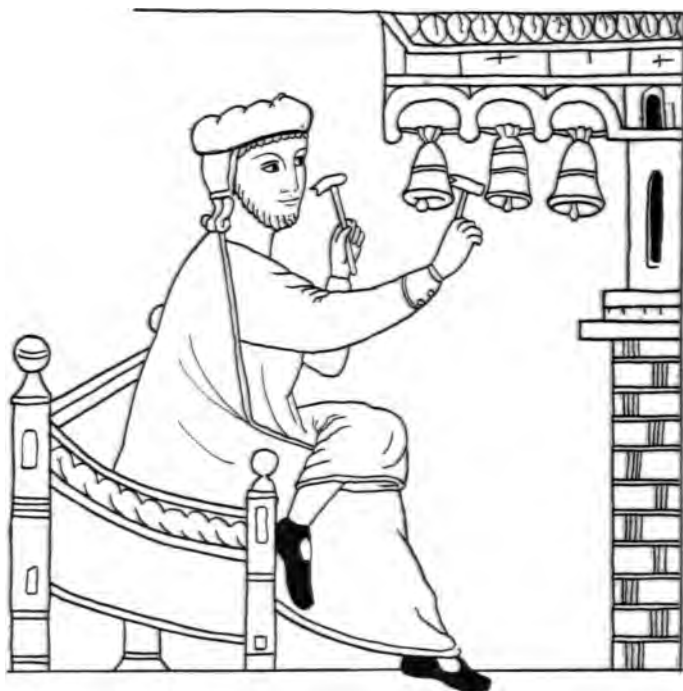
Group 131. EGYPT.

- a. EGYPTIAN CYMBALS. Bonanni, "Istromenti Armonici," pl. 99.

WESTWARD.

Group 130. GREECE, including Etruscan and Græco-Roman Art.

- a. CASTANETS (*Crotala*). Naumann, "History," vol. i., p. 127.
- b. ROMAN BELLS (*Tintinnabula*). Bonanni, "Istromenti Armonici," pl. 91.
- c. CASTANETS (*Crotala*). Engel, "Catalogue," p. 45.



BELLS.
Western Europe.
Page 35. Group 129 c.

Group 129. WESTERN EUROPE.

- a. CYMBAL. From the Codex of the Cantigas de Santa Maria. 13th Century. Riano, "Early Spanish Music," p. 116. (See note, Group 17.)
- b. CYMBAL. From a Spanish manuscript of the 11th Century. *Id.*, p. 109.
- c. BELLS. From the Codex of the Cantigas de Santa Maria. 13th Century. *Id.*, p. 118. (See note, Group 17.)
- d. BELLS. *Id.*, p. 110.

EASTWARD.

Group 132. ASSYRIA.

- a. ASSYRIAN CYMBALS. Engel, "Music," p. 74.

Group 133. PERSIA and ARABIA.

- a. PERSIAN CYMBALS (*Sindj*). Bonanni, "Istromenti Armonici," pl. 93.

Group 134. INDIA.

- a. CYMBALS. From a native drawing. Day, "Music," p. 91.
- b. CYMBALS. Mahillon, "Catalogue," vol. i., p. 129.

Group 135. EASTERN ASIA.

- a. CHINESE GONG. Naumann, "History," vol. i., p. 17.
- b. SIAMESE GONGS. Mahillon, "Catalogue," vol. i., p. 385.
- c. CHINESE HARMONICON (*King*). This instrument was used in China 2200 years before the Christian Era. Amiot, "Mémoires," vol. vi., pl. 28.

Group 136. AMERICA.

- a. SHELL CYMBALS. From an ancient Peruvian terra-cotta water jar. Mead, "Incas," pl. 2.
- b. SHELL CYMBALS.

RATTLE AND CLAPPER TYPE.**EGYPT.**

Group 139. EGYPT.

- a. EGYPTIAN RATTLE (*Sistrum*). Stainer, "Music," p. 146.
- b. EGYPTIAN CLAPPERS. *Id.*, p. 148.

WESTWARD.

Group 138. GREECE, including Etruscan and Græco-Roman Art.

a. CLAPPERS. Engel, "Catalogue," p. 45.

Group 137. WESTERN EUROPE.

a. CLAPPERS. From the Codex of the Cantigas de Santa Maria. 13th Century. Riano, "Early Spanish Music," p. 110. (See note, Group 17.)

EASTWARD.

Group 140. ASSYRIA.¹

Group 141. PERSIA and ARABIA.¹

Group 142. INDIA.¹

Group 143. EASTERN ASIA.

a. CHINESE CLAPPERS (*Cha-Pan*). Naumann, "History," vol. i., p. 17.

Group 144. AMERICA.

a. RATTLE (attached to waist). Decoration from ancient Peruvian terra-cotta vessel. Mead, "Incas," pl. 1.

¹ No ancient example known.

III. TYPE CASES.

III.

TYPE CASES.

SHOWING THE LEADING EUROPEAN INSTRUMENTS, WITH
KINDRED FORMS IN DIFFERENT COUNTRIES.

INTRODUCTORY NOTE.

The groups of instruments displayed in this section are arranged according to the European Classification: String, Wind, Vibrating Membranes, and Sonorous Substances. The European specimen, outlined with yellow cord, is placed in the centre of the case; and grouped about this are the kindred forms as they appear in different countries. The primitive harp of the African savage may thus be compared with the European harp; the reed pipe of the ancient Egyptians—still found among the people of the Nile—with the clarinet of the modern orchestra; and in like manner, each of the more important instruments in use to-day may be studied and compared with their parallel forms in the different stages of development.

CATALOGUE
OF
CLASS I. STRINGED INSTRUMENTS.¹

SECTION A. PLUCKED STRINGS.

HARP TYPE.

CASES 113-114.

In the evolution of the Harp, the Musical Bow, which had its origin in the hunting bow, shows this type in its simplest form; and from this primitive instrument has developed the harp as we know it to-day. By degrees the single string was supplemented by others. The harp of Brian Boiroimhe, of the 11th Century, shows an early example of the form embodying a front pillar, which in later years was perfected in Western Europe. The boat-shaped harp of the ancient Egyptians still finds its parallel in the Soung of Burmah, and, in a ruder form, in the Nanga of the tribes of Central Africa. The lyre form of harp, as found in ancient wall paintings and sculpture and as immortalized by the Greeks, is still found in its primitive form in the Kissar of the Lake Regions, Africa. The modern harp as employed in the orchestra of to-day is but little changed since the days of Erard, who in 1810 perfected the pedal action invented by Hochbrücker in 1720.

EUROPEAN FORM.

2125. **HOKED HARP.² EUROPE.** Body formed of seven strips of wood; the soundboard plain, without holes. Up-right pillar. On the curve are 11 hooks or crochets, by turning which the strings passing over them are raised a semitone. This invention, which dates from about 1700, was the first attempt to apply mechanism for producing semitones on the diatonic harp. Height of pillar, 4 feet 3 inches.

¹ See Hand-Book No. 13, Europe. Preface to Stringed Instruments, p. 11; also Kindred Instruments, p. 17.

² See "Musical Instruments in the South Kensington Museum," Carl Engel, p. 236.

KINDRED FORMS.

2056. GUBO. EASTERN AFRICA. Musical Bow. A narrow strip of wood, between the ends of which is stretched a string of vegetable fibre. A section of the shell of a gourd, with four small pieces attached as a rattle, fastened near one end of the bow, and the edge of this rests against the chest of the performer when the instrument is being played. Played by plucking with the finger.

Length, 2 feet $10\frac{1}{2}$ inches.

2937. PINAKA. INDIA. Musical Bow. A narrow strip of polished wood, with a single string passing through a hole at one end and fastened to a peg at the opposite end. Played by plucking with the finger or plectrum.

Length, 4 feet.

3480. YEKTAR, or TUTUNI. WESTERN INDIA. A piece of wood, slightly curved, with a cylinder of wood, one end closed by parchment, fastened to the lower side. A wire passed through the centre of the parchment to the upper end of the stick, where it is wound about a peg. This is plucked by a bit of wood, and the instrument is used by itinerants to accompany their songs or recitatives.

Dimensions of drum, $8 \times 5\frac{1}{8}$ inches. Length of stick, 1 foot 7 inches.

2035. KASSO. AFRICA. A section of a large gourd closed by a membrane, and pierced by a long, straight stick, finished at the top with a rattle made from a thin piece of metal, edged with small rings. Beneath the membrane, and protruding at points near the edge of the gourd, are four sticks; two parallel with the strings and two perpendicular to the neck. Six sinew strings are attached to loops of the same on the neck. An upright bridge with notched edges, placed midway between the centre of the membrane and the top of the gourd, usually rests on a small cushion, which in this specimen is missing. The strings pass on either side of the bridge, and are gathered together and fastened to the protruding end of the neck.

Height, 2 feet 5 inches. Diameter of gourd, $9\frac{1}{2}$ inches.

This instrument is found in Senegambia and the Bissagos Islands on the Northwest coast. The number of strings varies. On the borders of the Senegal it is called *Kove*.

1412. OMBI. AFRICA. An oblong case of resonant wood covered with leather, with one sound hole; the lower side extended and finished in a rudely carved ornament just below the point where the arched neck is fastened to the body. Eight pegs with strings of vegetable fibre. A bridge beneath the surface of the leather holds the strings in place.

Length, 2 feet $6\frac{1}{2}$ inches. Width, $4\frac{1}{4}$ inches.

The Ombi is the native harp of the Bakalai, a tribe near the Equator. A similar form is found among the Fans of the West Coast, where it is called *N'gomi*.

926. NANGA. AFRICA. A hollowed block of wood, bowl-shaped, the opening covered with leather stretched over the edges and laced to a square of leather at the back. The lacing is done with cord of vegetable fibre in two colors closely woven. One sound-hole. An arched neck at one end, with eight pegs and strings of sinew. A ring of snake skin beneath each peg.

Length, 2 feet 9 inches. Width, $8\frac{1}{4}$ inches.

This instrument comes from Uganda, British East Africa. A similar instrument is attributed by Ankermann to the Waganda Tribe, "Die afrikanischen Musikinstrumente," Berlin, 1901, p. 15.

2755. KUNDI. AFRICA. A hollowed block of wood covered with leather, with two sound-holes. An arched neck, finished with a rude carving of a human head, has five pegs and strings of hair from the tail of a giraffe.

Length, 1 foot 10 inches. Width, $3\frac{3}{4}$ inches.

The *Kundi* is a form of *Nanga* found among the Zandeh Tribe in Central Africa.

2807. KISSAR. AFRICA. Lyre form of harp. A section of a gourd, the opening covered with membrane, the edges laced together at the back by strips of same. Two uprights, united by a bar at the top wound with cloth, from which four sinew strings pass to a point on the lower edge of the gourd, where they are brought together and fastened.

Height, 2 feet 7 inches. Diameter of gourd, $8\frac{1}{2}$ inches. Width at top, $11\frac{3}{4}$ inches.

The Kissar is found principally in the Eastern districts of Africa, and has a variety of names. In Egypt, it is called *Gytarah Barbaryeh*, and is considered the national instrument of the Barabras, or Berbers, who are supposed to be the original inhabitants of the land. The Mittos, a Nubian tribe, call it *Tohmoo Rebaba*, while in other districts of Nubia it is called *Kisirka*. In the Lake regions the uprights are often made from the horns of some animal, and it is then called *Kinanda*. The Abyssinians have a ten-stringed *Kissar*, which they call *Bagana*.

Cp. Greek lyres. Engel, "Musical Instruments in the South Kensington Museum," p. 36.

3159. **SOUNG. BURMAH.** A boat-shaped harp, in black enamel and gilt, with a curved neck of natural wood at one end, from which thirteen silk strings pass to a bridge beneath the sound-board. Four sound-holes. The tension of the strings is adjusted by moving the cords on the curved neck.

Length, 3 feet $5\frac{1}{2}$ inches.

The *Soung* is also called *Saun*, *Tsoung-gouk*, and *Thembogyoung*. Engel, "Musical Instruments," p. 174.

PSALTERY TYPE.

CASE 115.

In the Psaltery is shown the prototype of the spinet and harpsichord. This form of instrument, in which the strings are plucked with a quill, was much in vogue in the Middle Ages, as is evidenced in the sculpture and manuscripts of that period. It still appears in the *Koto* of Japan, the *Ch'in* of China, the *Kanoon* of Turkey, and the *Marouvane* of Madagascar. In Western Europe, however, it has, in its original form, long since disappeared; but in its modern form, the *Zither*, it is still a popular instrument in Germany.

EUROPEAN FORM.

2231. **PSALTERY. EUROPE.** Trapeze-shaped case, with two round sound-holes. Fifteen steel strings pass over two metal bridges, and are tuned by fifteen iron pegs placed upon the side of the instrument.

Length, 1 foot $5\frac{1}{2}$ inches. Width, 9 inches.

KINDRED FORMS.

109. **KOTO. JAPAN.** A long, narrow body of kiri wood. Thirteen silk strings, each having a movable bridge. The strings are plucked by small ivory plates in leather stalls worn on the finger-tips, and called *tsume*.

Length, 5 feet 11 inches. Width, $9\frac{3}{4}$ inches.

There are different forms of the *Koto*; this variety is the most popular, and is used by the professionals of Eastern Japan. It is called the *Yamada Koto*, and has a special form of *tsume*.

2892. CH'IN, or KIN. CHINA and JAPAN. A narrow, tapering body of lacquered wood, inlaid with thirteen mother-of-pearl dots, which indicate the position of the notes. Seven silk strings.

Length, 4 feet 1 inch. Width, 8 inches.

In China this instrument is used at imperial and Confucian ceremonies, and is called the scholar's lute. The same form of instrument is found in Japan, where it is called *Shichi-gen-kin*—seven-stringed lute.

2961. NI-GEN-KIN. JAPAN. A section of bamboo, forming a body with a convex surface and a flat back. Two silk strings tuned in unison; two tuning pegs at one end. The strings are plucked with ivory cylinders (*tsume*) worn on the finger-tips.

Length, 3 feet 1½ inches. Width, 3 inches.

2216. MAROUVANE. MADAGASCAR. A tube of bamboo, with thirteen strings cut from the bark and raised from the surface by small blocks, placed at the ends, which serve as bridges.

Length, 1 foot 11 inches. Diameter, 2½ inches.

342. KANOON, or QĀNON. ARABIA, PERSIA, and TURKEY. A trapeze-shaped, shallow sound-box, pierced with three holes, the sides inlaid with pearl and ivory. Seventy-eight gut strings, arranged in groups of three, tuned in unison. Beneath the bridge the soundboard is cut away and replaced by parchment.

Length, 3 feet. Width, 1 foot 3 inches. Depth, 2 inches.

Drexel Collection.

LUTE TYPE.

CASES 116 and 117.

There is, perhaps, no instrument that lends itself more readily to artistic treatment than the Lute. The ancient Egyptians made use of it in their hieroglyphic characters when they wished to convey the idea of beauty and goodness, and it constantly appears upon the obelisks as well as on the mummy-cases of those bygone days. In India the Sitar in its various forms is always beautiful, as is also the case with the graceful Theorbo and Chitarrone of Italy. The popularity of the Lute equals its beauty, and it appears in the most varied forms. With the African savage the body is made from the

shell of a tortoise or a gourd; in India the egg of an ostrich is sometimes used; while the American negro is content to form his Banjo from a cheese-box when nothing better offers. Only with the American Indian and the South Sea Islanders do we find this type of instrument missing; in all other parts of the globe it appears in forms more or less developed as a ready accompaniment to the voice. All the more striking is it, in view of its wide distribution and deserved popularity, that the mediæval Lute should now be obsolete, the Mandoline being the only form remaining in common use.

EUROPEAN FORM.

3138. LUTE. EUROPE. A pear-shaped body, formed of eight strips of dark wood, with ivory inlay at the back of the neck. Finger-board of ebony. Peg-box placed at a right angle to the neck, with ten pegs. Three pairs of gut strings, two of overspun. Geometric rose.

Length, 2 feet 11 inches. Width, 11 inches.

KINDRED FORMS.

2745. YUEH CH'IN. CHINA. A circular wooden box, with a short neck, terminating in an open peg-box. Four tapering pegs and four silk strings. Eight frets on the front of the body, and two on the neck. A vibrating wire placed on the inside of the sound-box.

Length, 1 foot 11 inches. Width, 1 foot 1½ inches.

2752. P'I-P'A. CHINA and JAPAN. A pear-shaped body, with a slightly rounded back. The peg-box placed at a right angle to the neck, as in the European lute. Large, tapering pegs and four silk strings. Four high wooden frets on the sound-board, and five convex ivory plates on the neck. Played with a plectrum of shell or wood.

Length, 2 feet 11½ inches. Diameter, 9½ inches.

In Japan a similar instrument is called *Bûwa*.

2743. SAN HEEN. CHINA. A circular wooden frame, the two open sides covered with snake-skin. A long, narrow neck, with an open peg-box and three pegs. Three silk strings.

Length, 2 feet 10 inches. Diameter, 5¾ inches.

2958. SAMISEN. JAPAN. A square frame of polished wood, the open sides covered with parchment. A long, narrow neck, with an open peg-box and three pegs. Three silk strings. Played with a plectrum called *Bachi*.

Length, 3 feet 2½ inches. Diameter, 8 inches.

2933. SITAR. INDIA. A body formed from the section of a gourd, with a broad, flat neck, and front of cocoa-wood, the surface highly polished, and the edge inlaid with a border of ivory. At the top of the neck, three pegs on the side and two in front. Two pegs on the side near the middle. Seven wire strings. Carved ivory bridge and tailpiece. Sixteen movable metal frets on the neck.

Length, 3 feet 10 inches. Diameter of gourd, 10½ inches.

2932. VINA. INDIA. A round, wooden bar, mounted with seven wire strings, five of which are supported by twenty-one movable bridges, two of the remaining three placed on one side, and one on the opposite side. One end of the bar carved in the form of a bird. Eight tuning pegs. Beneath the bar, at either end, two large gourds, which serve as resonators.

Length, 4 feet 7¾ inches. Diameter of gourds, 1 foot 3 inches.

The *Vina* is held with one gourd resting on the left shoulder, the other under the right arm. The strings are plucked with small plectra made of wire or fish scales, worn on two fingers of the right hand.

3104. TANBOUR, or TAMBOURA. PERSIA and TURKEY. A pear-shaped body, with a long, narrow neck, pierced at the top with four T-shaped pegs. Wire strings and eighteen gut frets. Three sound-holes. Reproduction.

Length, 3 feet 2 inches.

358. SAZ. PERSIA and TURKEY. Similar to preceding, but of smaller dimensions. The back pierced with geometric design. Soundboard and neck inlaid with ivory. Five pegs. Strings missing. Fourteen gut frets. A single hole in the soundboard.

Length, 2 feet. Diameter, 5 inches.

378. OUD, or EL OUD. ARABIA and NORTHERN AFRICA. A pear-shaped body, formed of fourteen narrow strips of wood, with light wood inlay. Ebony neck, with an open peg-box placed at a right angle to the neck. Twelve pegs. Six pairs of strings, four of gut and two of fine wire. Geometric rose. Rose and soundboard restored (?).

Length, 3 feet 1 inch. Width, 1 foot 2¼ inches.

355. GUENBRI. ARABIA and SYRIA. A circular body, made from a section of a gourd, the opening closed by a membrane and edged with fringed leather and shells. A long, round neck, with two pegs. Two gut strings, fastened to a small peg at the base of the gourd.

Length, 1 foot 10 inches. Width, 6 inches.

2526. GUENBRI. AFRICA. A pear-shaped body of wood, covered with parchment. A long neck with a knobbed end, finished in a prong, which pierces the skin and holds the two gut strings.

Length, 1 foot 9 inches. Width, $3\frac{3}{4}$ inches.

401. KOUITARA, or KUITRA. MOROCCO and ALGERIA. A pear-shaped body of wood, the entire surface inlaid with mother-of-pearl and colored woods. The soundboard pierced with a geometric design. Four pairs of gut strings. Eight pegs inlaid with pearl. A short, narrow neck of ebony, the peg-box bent back at a slight angle.

Length, 2 feet $10\frac{1}{2}$ inches. Diameter, 10 inches.

The *Kouitara* is popular in Northern Africa, and, like many of the instruments of that section, shows strong Arabian influence.

CLASS I. STRINGED INSTRUMENTS.

SECTION B. STRUCK STRINGS.

DULCIMER TYPE.

CASE 118.

In this, the prototype of the Clavichord and Piano, is shown an instrument of which there are few parallels. The Dulcimer, which in Colonial days was almost as popular as the piano is to-day, has long since passed into disuse in this part of the world. Among the Hungarians, however, it is still popular, if not indeed the national instrument of that country. In China, the Yang Ch'in, with its bamboo hammers, and in Turkey the Santir, similar in form to the Kanoon, are not uncommon. It is interesting to compare with the Tambourin à Cordes, a rustic instrument of Central France, the curious Agong of the Philippines, in which the principle of struck strings is interestingly illustrated in a most primitive form.

EUROPEAN FORM.

1004. DULCIMER. Trapeze-shaped case resting on four feet, the sides painted with gilt scroll-work. The soundboard, edged with gilt moulding and having 2 ornamental roses, is furnished with 26 sets of triple strings, attached to small brass pins on one side. Seven movable bridges, placed upon the soundboard, regulate the pitch of the strings, the bass strings passing through the circular openings. France. 18th Century.

Length, 2 feet 6 inches. Width, 13½ inches.

KINDRED FORMS.

2951. GUBO. AFRICA. Musical Bow. A narrow strip of elastic wood, between the ends of which is stretched a string of vegetable fibre. Near one end is a gourd, which serves as a res-

onator. The bow is held in the left hand in a horizontal position, the gourd resting against the chest of the player, while the string is struck by a small stick held in the right hand.

Length, 4 feet 3 inches. Diameter of gourd, $4\frac{1}{2}$ inches.

2848. QUIJONGA. COSTA RICA. A narrow strip of natural wood, with a gourd attached near one end, as in the previous specimen. A wire stretched between the two ends of the stick is struck with a small stick.

Length, 5 feet 10 inches. Diameter of gourd, $3\frac{1}{2}$ inches.

2936. SAR MUNDAL. INDIA. A quadrangular box of black wood, mounted with nine wire strings, fastened to pegs on the lower edge. Two wooden sticks serve as hammers.

Width, 11 inches. Short side, 7 inches; opposite side, 12 inches.

19. YANG CH'IN. CHINA. A quadrangular box mounted with 72 fine wire strings arranged in groups of four tuned in unison. These are fastened at one end to small hitch-pins from which they are carried alternately through and over two open bridges to the opposite side of the case where they are wound about metal tuning pins. Two strips of paper on the sound-board indicate the notes.

Length, 2 feet 8 inches. Width, 11 inches.

The Yang Ch'in is probably of comparatively modern origin—perhaps a modification of the Santir, which is known in Hindustan, as well as in Western Asia. (Engel, "Musical Instruments," p. 182.)

1374. SANTIR. PERSIA and TURKEY. A trapeze-shaped box mounted with eighty fine wire strings, arranged in groups of four tuned in unison. Movable bridges, some missing. Pierced decoration in the soundboard. Two metal hammers.

Length, 2 feet $6\frac{1}{2}$ inches. Width, 1 foot. Depth, $2\frac{3}{4}$ inches.

2800. TAMBOURIN À CORDES. FRANCE. Oblong case of plain wood, the soundboard decorated with a small ornamental rose; six gut strings, fastened through holes at the small end, pass over two bridges, and are put around staples and attached to five turned pegs inserted in the end of the case. The block decorated with two small scrolls of wood.

Length, 3 feet $1\frac{1}{2}$ inches. Width, 7 inches.

This instrument, which is still used in Provence, is held across the left arm, and struck with a small stick held in the right hand, while the left hand of the performer holds a small 3-holed pipe, the *Galoubet*, or *Chirula*. This instrument is also called *Tambourin du Béarn*.

2746. AGONG. PHILIPPINE ISLANDS. A large tube of bamboo, with a small square opening cut from the centre on one side. Over this opening is a small strip of bark, suspended by means of two fibre strings cut from the surface of the tube and raised at the ends by pieces of wood, which serve as bridges. The performer strikes the piece of bark suspended over the opening with two bamboo sticks.

Length, 2 feet 2 inches. Diameter, $3\frac{1}{2}$ inches.

A native instrument of the Moros of Mindanao. The National Museum at Washington, D. C., has a similar specimen from the Nias Island, west of Sumatra, the native name of which is *Kramba*.

Note the similarity of this instrument to the foregoing specimen (No. 2800) from Provence, France.

CLASS I. STRINGED INSTRUMENTS.

SECTION C. BOWED STRINGS.

VIOL TYPE.

CASE 119.

While among the ancient Egyptians no record of a bowed instrument is found, in India, some four thousand years ago, Ravanon, King of Ceylon, is credited with having substituted, for the notched stick of his fathers, the horsehair bow; and in the Erh H'sien, or Ur Heen, of the Chinese is found the parallel of the ancient Indian Ravanastron supposed to have been invented by this ancient king. Be that as it may, the modern violin but faintly resembles the rude fiddle of the Orient, and the curved bow with its bunch of horsehair is a poor substitute for the compact Tourte Model bow of to-day. Bowed instruments of divers forms appear in almost every country; but here, again, we find the Indians of North America lacking. Only among the Apaches, a tribe near the Mexican border, has any stringed instrument played with a bow been discovered. In the Viol, which appeared in Europe during the 16th Century and became obsolete with the 18th Century, is shown the first step in the direction of the violin of to-day. In the Hardanger Violin, the Viole d'Amour, and

the Sarod of India, the ordinary strings are supplemented by sympathetic strings and tuned in unison with them. The *Viole d'Amour*, while not obsolete, is seldom heard to-day; but the Violin, Viola, 'Cello, and Bass form the foundation upon which the modern orchestra has been built.

EUROPEAN FORMS.

3510. VIOLIN. EUROPE. Moulded half-back, with F sound-holes. Peg-box terminating in a scroll. Dark varnish.
Length, 1 foot 11 inches. Width, 8 inches. Depth, 1½ inches.

2726. VIOLE D'AMOUR. EUROPE. Narrow model, with flat back and sloping shoulders. Dark varnish. Flaming sound-holes. A long, open peg-box terminating in a scroll. Fourteen pegs, seven tuning melody strings of gut, and overspun and seven sympathetic strings, which run beneath the finger-board and are attached to the bottom of the instrument by small brass pins.
Length, 2 feet 6 inches. Width, 9½ inches. Depth, 1¼ inches.

KINDRED FORMS.

2744. ERH H'SIEN. CHINA. A small wooden cylinder, the opening at one end covered with snake-skin. Two large pegs pierce the long, narrow neck from the back. Two silk strings.
Length, 1 foot 6 inches. Diameter, 2½ inches.
The *Erh H'sien* resembles the ancient Indian *Ravanastron*.

2955. KOKIU. JAPAN. A square wooden frame, the open sides covered with white skin. Long, polished neck of dark wood, with an open peg-box and four long pegs. Four silk strings fastened to a metal foot-rest. Horsehair bow.
Length, 2 feet 2½ inches. Diameter, 5 inches. Length of bow, 2 feet 10½ inches.

3160. THRO. BURMAH. A violin-shaped body of stained wood, with a short neck and open peg-box, surmounted by a rudely carved figure of a deity. Three silk strings. A heavy horse-hair bow.
Length, 2 feet 10 inches. Width, 8 inches. Length of bow, 1 foot 9½ inches.

2935. SARINDA. INDIA. Body carved from a solid block of wood. Round shoulders and incurved sides, which taper to the base below the centre. The lower portion of the sound-box covered with parchment, the upper part open. Square peg-box, with three knobbed pegs. Three gut strings. The bow resembles that of the ordinary violin.

Length, 1 foot $9\frac{1}{2}$ inches. Width, 7 inches. Depth, $4\frac{1}{2}$ inches. Length of bow, 1 foot $6\frac{3}{4}$ inches.

2725. SARANGI. INDIA. A pear-shaped body, with sides slightly incurved, and tapering to a square peg-box at the top. Three knobbed pegs and three wire strings; also nine pegs on the side, with sympathetic strings of fine wire.

Length, 1 foot 11 inches. Diameter, $5\frac{1}{2}$ inches.

2934. SARUNGI. INDIA. A quadrangular wooden body, broad at the base and tapering toward the top, with sides incurved. Four pegs at the top, with heavy gut strings, and eleven pegs on the side, with sympathetic strings of fine wire.

Length, 1 foot $8\frac{1}{2}$ inches. Width, $6\frac{1}{2}$ inches. Depth, 5 inches. Length of bow, 1 foot $8\frac{1}{2}$ inches.

2841. KEMANGEH. PERSIA, ARABIA, and NORTH-ERN AFRICA. A body formed from a cocoanut shell, the opening closed by membrane. A long neck with knobbed head and two knobbed pegs. A string of horsehair fastened to a ring attached to the iron spike or foot-rest.

Length, 3 feet $1\frac{1}{2}$ inches. Diameter, $4\frac{1}{2}$ inches. Length of bow, 2 feet $4\frac{3}{4}$ inches.

390. REBAB. ARABIA and SYRIA. A square wooden frame covered with skin. A neck of natural wood, with a single peg rudely cut. The string of horsehair is bound to the neck near the centre, and regulated by the peg at the top. An iron spike or foot-rest. Horsehair bow.

Length, 2 feet 2 inches. Width, 8 inches. Length of bow, 1 foot 11 inches.

2734. FIDDLE. APACHE INDIANS. NORTH AMERICA. A cylinder formed from a section of stalk of the Yucca Palm, decorated with a geometric design in color. A single string of horsehair, adjusted by means of a small peg inserted at the top. Horsehair bow.

Length, $12\frac{1}{2}$ inches. Diameter, $1\frac{3}{4}$ inches. Length of bow, $11\frac{1}{2}$ inches.

CATALOGUE
OF
CLASS II. WIND INSTRUMENTS.

SECTION A. WHISTLES.¹

Under Whistles may be classed all vertical and transverse Flutes in which the sound is produced by the projection of the breath against a sharp edge either on the end of the tube or on its side. Among the vertical Flutes are various forms, the simplest being found in the Panpipes of the South Sea Islanders, or in the Nay of Arabia and Northern Africa, which latter instrument was in use among the ancient Egyptians. From a simple tube of bamboo has developed the Boehm Flute of the modern orchestra, with its intricate mechanism. The direct or vertical Flute was popular in England in the 16th Century, and is referred to by Shakespeare as the Recorder.² Praetorius also mentions Flute concerts in which this was the only instrument used, there being some twenty employed in such an orchestra. Among the North American Indians Flutes are very popular. There is the simple bone Flute, used in ceremonial dances, and made from the bone of an eagle; the Lover's Flute, used while the Indian youth courts his lady love; and various forms of whistles. With the African savage few examples of wind instruments are found, save the War-Horn, made from the tusk or horn of an animal; while in the South Sea Islands pipes of all descriptions abound. In China and Japan the flutists are often women, as was the case in ancient Egypt; while in Java the native has a Nose Flute. But whether we look East or West, North or South, each example shows the same principle in different stages of development.

¹ See Hand-Book No. 13, Europe, p. 101 ff.

² *Hamlet*, act iii., scene 3.

VERTICAL TYPE

CASE 120.

EUROPEAN FORMS.

2646. FLÛTE DOUCE. EUROPE. Inverted conical tube of stained wood, mounted with ivory, the lower end expanding into a small bell. Beaked mouthpiece faced with ivory. Seven holes in front and one at the back.
Length, 1 foot 5½ inches.
2926. FLÛTE DOUCE. EUROPE. Recorder. Inverted conical tube of stained wood, pierced with seven holes in front, the lowest closed by a brass key, having double touchpiece, working under a perforated cover. One hole at the back. This instrument is blown through a small hole in the cap.
Length, 2 feet 3½ inches.

KINDRED FORMS.

1330. NAY (*Nei*). ARABIA and NORTHERN AFRICA.
A tube of bamboo, with six holes in front.
Length, 1 foot 9 inches.
449. DUDUKI. TURKEY. A tube of dark wood, with six holes in front and one at the back.
Length, 17 inches.
2453. CHABBEBEH. PERSIA. A tube of light wood, with six holes in front and one at the back.
Length, 11 inches.
221. ALGOJA. INDIA. A tube of natural wood, with a beaked mouthpiece. Five holes in front near the lower edge. The surface decorated with bands pencilled in silver.
Length, 1 foot 4¼ inches.
60. HSIAO. CHINA. A tube of bamboo, stained and polished, the surface etched with Chinese characters. The lower edge tipped with bone. Five holes in front, one at the back, and two on either side near the lower edge.
Length, 1 foot 11½ inches.
2844. SHAKUHACHI. JAPAN. A tube of thick bamboo, with four holes in front and one at the back.
Length, 1 foot 11¼ inches.

2860. KRENA. SOUTH AMERICA. A tube of natural wood, with four holes in front, one at the back, and one on the side near the lower edge.
Length, 1 foot $5\frac{3}{4}$ inches.
648. POTTERY WHISTLE. AZTEC. A small bulbous body, with a narrow, flattened tube mouthpiece. One hole in the centre.
Length, $1\frac{1}{2}$ inches.
2336. POTTERY WHISTLE. CHINA. Moulded in the form of a bird, and decorated in bright colors.
Width, $2\frac{1}{4}$ inches.
2059. BONE WHISTLE. SIOUX INDIANS, NORTH AMERICA. Made from the bone of a bird, and decorated with bright feathers and bits of tin.
Length, $8\frac{1}{4}$ inches.
2680. WOODEN WHISTLE. HAIDA INDIANS, ALASKA. Two hollowed sections of wood, fastened at the sides with pitch, and bound about the lower edge with strips of bark.
Length, $10\frac{1}{4}$ inches.

TRANSVERSE TYPE.

CASE 120.

EUROPEAN FORM.

3392. TRANSVERSE FLUTE in C. EUROPE. Inverted conical tube of granadilla wood, mounted with silver, and furnished with eight flat metal keys.
Length, 1 foot 11 inches.

KINDRED FORMS.

2727. NOSE FLUTE. MALAY PENINSULA. A thick tube of bamboo, the surface covered with burnt lines in squares and triangles. Five holes in front, a hole on either side of the central hole, and one at the back. Ends closed.
Length, 2 feet 3 inches. Diameter, 2 inches.
This form of decoration is typical of the Semong, a Negrito tribe of the Malay Peninsula.

2941. MURALI. INDIA. Cylindrical tube of white metal, the lower end finished in the form of an elephant's head. Six holes in front.

Length, 1 foot 1 inch.

2753. TI-TZU. CHINA. A cylindrical tube of bamboo, stained and polished, and tipped with bone. Floral decorations etched on the surface. Six holes in front. Breath-hole in the centre, and an extra hole, usually covered with thin membrane.

Length, 2 feet 2 inches.

128. FUYE. JAPAN. A cylindrical tube of light wood, the inside colored red, and the ends bound with waxed cord. Seven holes in front.

Length, 1 foot $3\frac{1}{4}$ inches.

CLASS II. WIND INSTRUMENTS.

SECTION B. REEDS.

This type of wind instruments is divided into two groups: beating reeds and free reeds. The first group is again divided into two subdivisions: single and double beating reeds. The former are those in which the column of air within the tube is set in motion by the vibration of a slip of reed upon a flat surface. This is illustrated in its simplest form in the reed pipes of the ancient Egyptians: the Arghoul and the Zummarah. These two instruments are still employed in Arabia and Northern Africa. This form of reed is supposed to have been employed in the famous Lady Maket Flutes, reproductions of which are shown in the Egyptian Type Case¹ (Gallery 36, Case 63); and in its latest stage of development is used in the Clarinet of to-day. The Chalumeau, which im-

¹ Hand-Book No. 13, Europe, p. 3.

mediately preceded the Clarinet in the line of development, was last used in the orchestra by Glück in the early 18th Century. Handel experimented with the Clarinet, but it was Mozart who finally established it as an orchestral instrument.

No record of a double reed has been found in ancient Egypt. In China, however, it is supposed to date back to great antiquity. In its primitive form it is represented in the Zourna of Arabia, Turkey, Persia, and India. A similar instrument with the Greeks is being called Floyera. In the English Shawm we find the immediate predecessor of the double-reed instrument, the Oboe, which forms so important a part in the modern orchestra, that is, important as sounding the A to which the whole orchestra tunes, a practice which dates from the time of Handel. In the wood wind, as in all wind instruments, it should be remembered that the tone is affected not by the material of which the instrument is made, but by the shape of the tube. Where the bore is cylindrical the tone produced is an octave lower than that sounded by a tube of the same length but of conical bore. The single-reed instruments with cylindrical bore are represented by the Arghoul, the Zummarah, and the Chalumeau. The single example of a single-reed instrument with a conical bore is the Saxophone. Double reed instruments with cylindrical bore are represented by the Krumhorn, the Kwan Tzu, and the Hitschiriki; those with a conical bore, by the Sona, the Zourna, the Floyera, the Shawm, the Oboe, and the Sarrusophone. In the Bagpipe is found a combination of single and double reeds with an air reservoir.

The free reed, a small metal tongue fixed at one end and vibrating in a metal frame, is employed in the Accordion and Concertina. It was introduced into Europe in the 18th Century. But in China, if tradition is to be trusted, the principle has been in use for four thousand years. It may be seen to-day in the Chêng, or mouth organ, as well as in a similar Japanese instrument known as the Sho. More primitive forms of mouth organs are found in India, Burmah, and as well in Borneo.

BEATING REED TYPE.**(1) SINGLE BEATING REEDS.****WITH CYLINDRICAL TUBE.****CASE 120.****EUROPEAN FORM.**

3440. CLARINET in B flat. EUROPE. A cylindrical tube of granadilla wood, mounted with German silver, and fitted with fifteen keys and two rings. Six open holes. Maker, Arles Bertin, Paris.

Length, 2 feet $2\frac{1}{2}$ inches.

KINDRED FORMS.

2633. ZUMMARAH. EGYPT. Two tubes of bamboo, bound together with waxed cord, each having a mouthpiece of a smaller tube, in the side of which is cut a vibrating tongue. Six holes in the front of each pipe.

Length, $12\frac{1}{2}$ inches.

2859. ARGHOUL. ARABIA. Similar to preceding, except that the tubes are of unequal length. Six holes in the shorter tube.

Length of long pipe, 3 feet 7 inches; short pipe, 1 foot $2\frac{3}{4}$ inches.

2046. REED PIPES. ARMENIA. Two small tubes of natural straw, with a vibrating tongue cut in the side of each. Six holes in the front of each.

Length, $8\frac{1}{2}$ inches.

These straw pipes are played by the peasant children of Armenia and other countries.

2824. GHETEH. EGYPT. A tube of bamboo terminating in a metal bell. A mouthpiece similar to the *Argoul*. Six holes in front.

Length, 1 foot. Diameter of bell, 2 inches.

2939. TUBRI. INDIA. Two reed pipes fitted in a gourd. Seven holes in the front of each, the lower ends of the pipes fitted with reeds.

Length, 1 foot $8\frac{1}{2}$ inches. Diameter of gourd, 4 inches.

2964. WOODEN WHISTLE. HAIDA INDIANS, ALASKA. Two narrow pieces of wood, one pierced with seven small holes, bound together with strips of bark. A ribbon reed made from a slip of fibre is placed between the two sides. Reproduction.

Dimensions, $1\frac{1}{2}$ x 3 inches.

2963. BONE WHISTLE. HAIDA INDIANS, ALASKA. A thin slip of wood bound to the end of a small bone, which is cut at an angle, forming a mouthpiece similar to that of the modern clarinet. Reproduction.

Length, $3\frac{1}{2}$ inches. Diameter, $\frac{1}{2}$ inch.

WITH CONICAL TUBE.

EUROPEAN FORM.

2565. SAXOPHONE. EUROPE. A straight conical brass tube, terminating in a metal bell. Sixteen holes, nine covered with brass keys. Wooden mouthpiece with beating reed.

Length, 2 feet 5 inches. Diameter of bell, $3\frac{1}{2}$ inches.

(2) DOUBLE BEATING REEDS.

WITH CYLINDRICAL TUBE.

CASE 120.

EUROPEAN FORM.

2825. KRUMHORN. EUROPE. A round tube of wood with cylindrical bore, curved upward at the lower end, and covered with leather. The instrument is sounded by a double-beating reed placed under a cap. Seven holes in front; at the bottom an extra hole to regulate the pitch. Reproduction from Prætorius.

Length, 2 feet 9 inches.

KINDRED FORMS.

132. HITSCHIRIKI. JAPAN. A cylindrical tube of bamboo, lacquered inside, and bound at the ends and between the holes with waxed cord. Seven holes in front, two at the back. Reed mouthpiece missing.

Length, $7\frac{1}{4}$ inches.

2898. KWAN TZU. CHINA. A cylindrical tube of stained wood tipped with bone. Double-reed mouthpiece. Seven holes in front and two at the back.
Length, $7\frac{1}{2}$ inches.
2861. E'RAQYEH. EGYPT. A cylindrical tube of wood, with seven holes in front and two at the back. A double-reed mouthpiece. Between the mouthpiece and the tube a small air chamber.
Length, $7\frac{1}{2}$ inches.

WITH CONICAL TUBE.

EUROPEAN FORMS.

3439. OBOE in C. EUROPE. Conical tube of cocus wood, mounted with German silver, and fitted with fifteen keys and two rings. Five open holes. Maker, Heckel Biebrich.
Length, 1 foot 9 inches.
886. BASSOON. EUROPE. Two long conical tubes of stained wood, fitted into a butt-joint, brass mounted. Six holes and four metal keys. Metal crook and joints.
Length, 4 feet $1\frac{3}{4}$ inches.

KINDRED FORMS.

2750. HEANG TEIH, or SONA. CHINA. A conical wooden tube, with seven holes in front and two at the back. A metal bell at the lower end. Double-reed mouthpiece fitted on a metal lip-guard.
Length, 1 foot 4 inches. Diameter of bell, $5\frac{1}{2}$ inches.
2959. CHARUMERA, or SATO. JAPAN. A conical tube of metal terminating in a small bell. Seven holes in front. A double reed fitted on a circular lip-guard. Reed missing.
Length, 1 foot 2 inches. Diameter of bell, $4\frac{1}{2}$ inches.
196. TOOMERI. INDIA. A conical tube of dark wood terminating in a metal bell, and fitted with a double-reed mouthpiece. A bone lip-guard. Eight holes in front, two on either side, and one at the back.
Length, 1 foot 9 inches.
1375. ZOURNA, or ZAMR. PERSIA, TURKEY, EGYPT, NORTHERN AFRICA. A conical wooden tube, terminating in a small bell. Seven holes in front and one at the

back; additional holes in the bell for altering the pitch. The neck of the instrument fitted with a small revolving cylinder, which may be so adjusted as to either close or open some of the holes. Below the mouthpiece a lip-guard, usually of bone or ivory.

Length, 1 foot.

The Zourna is very generally used in the East. The method of playing differs from that of the ordinary oboe, inasmuch as the reed is placed within the mouth, the lips pressing against the lip-guard, whereas in the modern oboe the reed is vibrated between the lips.

- I424. WOODEN WHISTLE. HAIDA INDIANS, ALASKA.** Two hollowed sections of wood, bottle shaped, bound together at either end with strips of bark. A primitive double reed cut from wood fitted in the smaller end. The larger end open.

Length, 7 inches. Diameter, 2 inches.

(3) SINGLE AND DOUBLE BEATING REEDS

WITH AIR RESERVOIR.

CASE 121.

EUROPEAN FORM.

- 2796. BAGPIPE. EUROPE.** A bag of figured silk in green and red. Ebony stock, fitted with two drones and a chanter with ivory joints; six holes in front and two behind. A double hole at the bottom for regulating the pitch. Double reed in the chanter, and single in the drones.

Length of chanter, 2 feet $7\frac{1}{2}$ inches. Length of drone, 1 foot 10 inches.

KINDRED FORMS.

- 2938. ZITTY. INDIA.** A bag of red leather, fitted with two short pipes and a wooden blow-pipe. Four holes in the chanter. Length of chanter, 5 inches.

- 1357. GHADA. TURKEY.** Bag of natural skin, fitted with two tubes of wood, bound together with cord. Six holes in each.

Length of pipes, 12 inches.

- 2717. ZOUGGARAH. EGYPT.** A bag of brown leather, fitted with reed pipes bound together, each terminating in a horn bell. Five holes in each. A wooden blow-pipe.

Length of pipes, 9 inches.

FREE REED TYPE.**CASE 121.**

EUROPEAN FORM.

1308. ACCORDION. EUROPE. A rectangular case containing bellows (fifteen fold). On the top of the case seven metal touches; at the back two thumb touches. Free reeds on the single-action principle.

Length, 7 inches. Width, $3\frac{3}{4}$ inches. When closed, 4 inches.

KINDRED FORMS.

97. CHÊNG. CHINA. A bowl-shaped air chamber of lacquered wood, in which are inserted sixteen bamboo pipes, held in place by a band of horn. A mouth-piece on the side of the air chest. Each pipe fitted with a free reed.

Height, 1 foot $4\frac{1}{2}$ inches. Diameter of bowl, 3 inches.

2957. SHO.¹ JAPAN. Similar to preceding. The bowl decorated with gilt beetles, and fitted with a metal mouth-piece. Sixteen pipes held in place by a metal ring.

Height, 1 foot 7 inches. Diameter of bowl, $2\frac{3}{4}$ inches.

2960. SHO-NO-FUYE. JAPAN. A shallow rectangular case with incurved sides, the surface decorated with a dragon-design in bright colors. Within the case, and projecting at either end, twelve cylindrical tubes, each fitted with a free reed.

Width of case, 1 foot 2 inches. Longest pipe, 1 foot $2\frac{1}{2}$ inches. Shortest pipe, $10\frac{1}{2}$ inches.

1552. SCHOSHI. JAPAN. Twelve cylindrical tubes of wood, each fitted with a free reed.

Longest pipe, 7 inches. Shortest pipe, $4\frac{1}{2}$ inches.

243. PHAN. SIAM and BURMAH. A block of wood, with a beaked mouthpiece at one side, and pierced with fourteen tubes of bamboo, each fitted with a free reed. A small hole in each pipe just above the point where it enters the block.

Longest pipe, 3 feet $4\frac{1}{2}$ inches. Shortest pipe, 2 feet 5 inches.

813. ENGERURAI. SEA DYAKS. BORNEO. Six reed pipes, inserted in a short-necked gourd. A vibrating tongue cut in each pipe where it enters the gourd.

Longest pipe, 9 inches. Shortest, $3\frac{1}{2}$ inches. Diameter of gourd, $3\frac{1}{2}$ inches.

In Burmah this instrument is called *Heem*.

¹ For a detailed description of this instrument, see "The Music and Musical Instruments of Japan," p. 185, F. T. Piggott.

CLASS II. WIND INSTRUMENTS.¹

SECTION C. CUP MOUTHPIECES.

The Conch Shell is perhaps the most primitive form of an instrument in which the sound is produced by the vibration of the lips within a shallow cup, although the Ox-Horn is equally crude. From the natural tube the advance has been gradual and by slow degrees. The introduction of the slide principle has produced the Trombone, while the addition of the side holes, and later the adoption of keys, and finally of valves, has turned the simple tube into the formidable brass instrument of to-day. While most cup mouthpieces are now made of brass, it must be remembered that this is simply a matter of convenience, as it is the bore of an instrument and the length of its tubing that affect its tone and pitch, and not the material of which it is made. The Chinese have a curious Funeral Trumpet of wood and brass; the African Chief has his War-Horn of ivory; the South Sea Islander employs wood; while in Europe examples are found in pottery and glass. The difference in bore in this class of European instruments may be illustrated in the Russian Ohotnitchiyerog (Gallery 35, Case 95), which is an admirable example of the conical bore; while the Trombone and Trumpet (Gallery 35, Cases 96, 97) may be mentioned as instances of the cylindrical bore.

CASES 122-123.**EUROPEAN FORMS.**

1771. **HORN. EUROPE.** A natural horn, probably from the antelope, without finger-holes and fitted with a cup mouthpiece. Length, 2 feet 2 inches.
1130. **CORNET À BOUQUIN. EUROPE.** A curved tube of wood with conical bore, and covered with leather. Six holes in front, with an additional lower hole closed by a brass key. Length, 3 feet.

¹ See Hand-Book No. 13, Europe, p. 101 ff.

2724. SERPENT. EUROPE. A conical tube of wood covered with leather, and bent in the usual serpentine form. Six holes.

Total length, 6 feet 9 inches.

2946. BASSON RUSSE. EUROPE. A wooden butt-joint with brass mountings. Into this are fitted two shorter tubes, one carrying the bell, the other the crook and mouthpiece. Six holes, three covered with flat metal keys.

Length of model, 3 feet 5 inches.

2719. OPHICLEIDE. EUROPE. A conical tube of brass, fitted with nine flat keys on pillars, and a tuning slide.

Length of model, 2 feet 10½ inches.

3106. COACH HORN. EUROPE. A straight conical tube of brass, fitted with a cup mouthpiece.

Length, 3 feet 10 inches.

3253. SLIDE TROMBONE. EUROPE. Cylindrical tube of brass, with a double slide.

Length of model, 3 feet 7 inches.

3127. TENOR HORN. U. S. A. Brass, with three rotary valves. Stamped "J. H. E., N.Y."

Length of model, 2 feet 5 inches.

3128. TENOR HORN. U. S. A. Brass, with three box-valves.

Length of model, 2 feet.

3129. TENOR HORN. U. S. A. Brass, with three piston-valves.

Length of model, 2 feet.

KINDRED FORMS.

3494. KANG-T'UNG. CHINA. A bone closely wound with waxed cord. A metal mouthpiece and bell, the latter in the form of a dragon's head.

Length, 1 foot 2 inches.

These trumpets are used by the lamas, or Buddhist priests, in the regions of the Himalayas, and are often made from the thigh-bone of a priest. In Russia a similar trumpet is called *Gangurih*, and is generally made from the bone of a slain enemy.

1817. RAPPAKAI. JAPAN. Conch Shell Trumpet. A conch shell fitted with a mouthpiece at the smaller end.

Length, 11 inches. Diameter, 6 inches.

The conch trumpet is used among the South Sea Islanders; also in Madagascar, where it is called *Antsiva*. In India it is called *Shunk*, and in China *Hai-lo*.

1444. SHUNK. INDIA. Similar to preceding, but of smaller size.

Length, $5\frac{1}{2}$ inches. Diameter, $3\frac{1}{2}$ inches.

2828. WAR-HORN. AFRICA. A section of an ivory tusk, finished with a band of leather at the larger end. A strip of snake skin around the smaller end. The mouthpiece on the inner side.

Length, 1 foot $4\frac{1}{2}$ inches.

This form of horn is very popular in Central Africa, Senegambia, and the Eastern Coast. It is known by different names: in the Congo district it is called *Embuchi*; in Angola, *Ponga*, or *Apunga*; in Upper Guinea, *Oukpwé*.

2893. LAPA, or CHA CHIAO. CHINA. A brass tube with cylindrical bore, the lower end curved upward and expanding in a bell. A flat, circular mouthpiece.

Length, 4 feet 6 inches.

2827. RANA SHRINGA. INDIA. A conical tube of metal, with five flanged joints, and bent in the form of the letter S.

Width of model, 3 feet.

CLASS III. VIBRATING MEMBRANES.¹

DRUM AND TAMBOURINE TYPE.

CASE 124.

This class of instruments illustrates that principle in which the sound is produced by the vibration of membranes stretched on a hoop or over a resonator. The former method is illustrated by the Tambourine of Europe and the Orient. The latter in the military Drum. In India, human skin, stretched over the open skull, forms one of the instruments employed in temple worship; in Japan and China various forms of the Drum are found, as is also the case in Northern Africa and Arabia.

EUROPEAN FORMS.

3139. SNARE DRUM. EUROPE. A metal cylinder with framework of maple, the heads of membrane held in place by metal clamps.

Diameter, 1 foot 5 inches.

2799. ONION FLUTE, or FLÛTE EUNNUQUE. EUROPE. A conical tube of dark wood, pierced with one hole, having at one end a covering of membrane, over which is placed a perforated bulb. The instrument is played by humming into the hole at the side of the tube.

Length, 2 feet 9 inches.

KINDRED FORMS.

2940. NYASTARANGA. INDIA. Throat Trumpets.

Two conical tubes of white metal, similar in form to the ordinary trumpet. When played, these instruments are held against the vocal cords while the performer hums an air. The vibrations thus produced act upon a piece of membrane on the interior of the tube, which increases the volume of the sound.

Length, 1 foot $2\frac{3}{4}$ inches. Diameter of bell, $4\frac{1}{2}$ inches.

¹ See Hand-Book No. 13, Europe, p. 207 ff.

2751. KOU. CHINA. Drum. A shallow circular frame, the open sides covered with skin held in place by brass tacks. A dragon-design in bright colors on one side. A metal ring on either side of the frame.
Diameter, $10\frac{1}{2}$ inches. Depth, 4 inches.
2816. DAIKO or TAIKO. JAPAN. Drum. A shell of lacquered wood in black and gilt. Heads of skin stretched over lacquered hoops, which extend beyond the edge of the cylinder and are laced together with heavy silk cords. The instrument rests in a wooden frame.
Height, 1 foot 1 inch. Diameter, $5\frac{1}{2}$ inches.
2943. DAMARU. INDIA. Drum. A small drum, the cylinder in the form of an hour-glass, decorated with red, yellow, and black lines. Heads of skin laced together with cords.
Height, 7 inches. Diameter of heads, $4\frac{1}{2}$ inches.
2942. DUFF. INDIA. Tambourine. Octagonal frame of stained wood, without decoration.
Diameter, 1 foot $7\frac{1}{2}$ inches.
3482. TASHIYA. INDIA. Drum. A shallow bowl of baked clay, with goat skin stretched over the opening. Two small beaters. Used by Mohammedans at the Feast of Shingar.
Diameter, $8\frac{1}{2}$ inches. Depth, $2\frac{1}{2}$ inches.
2801. DARABOUKKEH. ARABIA and NORTHERN AFRICA. Hand Drum. A bottle-shaped drum of engraved metal, the larger end covered with membrane.
Height, 1 foot 3 inches. Diameter of larger end, $9\frac{1}{2}$ inches.
In Abyssinia this instrument is called *Kobero*.
1807. DAYERE. PERSIA and TURKEY. Tambourine. A circular frame of wood, inlaid with ebony and ivory, and ornamented with coins, rings, and bells on the inner rim.
Diameter, 1 foot 7 inches. Depth, 2 inches.
In Turkey the tambourine is called *Diara*.
- 3157-3158. NAQUARREH. ARABIA and NORTHERN AFRICA. Hand Drums. Two small metal bowls, decorated with etched designs, the openings covered with skin, held in place by strips of same laced over the bowl. Reproduction (?).
Diameter, 6 inches. Height, 4 inches.

2833. HAND DRUM. NORTHERN AFRICA. Similar to preceding, but more conical in shape, and with a ring at the back.

Height, 6 inches. Diameter, 7 inches.

2862. WAR DRUM. AFRICA. A hollowed trunk of a tree, the ends covered with skin laced together with thongs of the same.

Height, 2 feet $1\frac{1}{2}$ inches. Diameter of larger end, $7\frac{3}{4}$ inches.

2026. DRUM. PUEBLO INDIANS, NORTH AMERICA. A circular frame of wood, over which two pieces of skin are stretched, the edges laced together, and decorated with bits of red flannel and feathers. The surface highly colored in red, yellow, and green.

Diameter, 1 foot $1\frac{1}{2}$ inches.

CLASS IV. SONOROUS SUBSTANCES.¹

RATTLE AND CLAPPER TYPE.

CASE 125.

Under this head belong Rattles, Bells, Gongs, and all instruments in which the sound is produced by the vibration of a sonorous substance. In China, instruments of this class abound, and in the Orient, as well as among savage peoples, various forms of Cymbals, Castanets, and Clappers are popular; but as civilization advances instruments of percussion are relegated to the background, and their place taken by instruments of greater refinement and delicacy. An interesting survival is the modern musical box, in which is illustrated the further development of the same principle employed by the African savage in his simple Zanzee, a small block of wood furnished with a set of metal tongues, from which, with his thumbs, he plucks the accompaniment to his songs.

EUROPEAN FORMS.

3398. MASS BELL. EUROPE. A shallow, circular bell of brass, with a perforated design and a ring handle. The names of the Apostles, Mathevs, Marcivs, Lvcas, Iohannes, appear in the decoration.

Height, $3\frac{1}{2}$ inches. Diameter, $3\frac{1}{4}$ inches.

3393. XYLOPHONE. EUROPE. Fifteen bars of wood fastened together by a cord. Two octaves.

Longest bar, $11\frac{3}{8}$ inches. Shortest, $5\frac{1}{8}$ inches.

WITH AUTOMATIC MECHANISM.

2888. MUSICAL BOX. A small wooden case containing a metal barrel, set in motion by a spring wound by a key from the outside, which plucks a series of steel tongues.

Length of case, $4\frac{1}{2}$ inches. Width, $3\frac{1}{4}$ inches.

¹ See Hand-Book No. 13, Europe, p. 217 ff.

KINDRED FORMS.

2948. CHA-PAN. CHINA. Clappers. Three narrow slabs of wood.
Length, 10 inches. Width, $2\frac{1}{4}$ inches.
2949. LO. CHINA. Gong. A circular metal gong, with a wooden beater.
Diameter, $6\frac{3}{4}$ inches.
2000. WANIGUCHI. JAPAN. Gong. Circular metal gong, suspended by cords attached to rings on either side.
Diameter, 4 inches.
These gongs are made in various sizes, some measuring two feet in diameter. They are hung at the entrance of shrines, and are struck with a heavy rope suspended in front of the instrument.
2838. MOKUGYO. JAPAN. Prayer Gong. A hollow body of wood, carved in the grotesque form of a fish.
Width, 11 inches. Height, 10 inches.
2818. CYMBALS. THIBET. Small circular discs of metal, with straps for the fingers.
Diameter, $7\frac{1}{4}$ inches.
259. GONG. BURMAH. A circular metal gong, with a boss in the centre.
Diameter, $7\frac{1}{4}$ inches.
2798. KURTAR, or CHITTIKA. INDIA. Clappers. A framework of hard wood, the surface carved to represent a fish. Four small bells and two sets of cymbals at each end.
Length, 9 inches. Width, $1\frac{1}{2}$ inches.
3481. TÂLA. WESTERN INDIA. Cymbals. Two small discs of brass, slightly concave.
Diameter, $2\frac{1}{2}$ inches.
491. MARIMBA. AFRICA. Ten strips of wood fastened together and attached to a framework carried about the neck. Beneath each strip of wood a gourd, which serves as a resonator. Two wooden beaters with rubber knobs.
Length of bars, 1 foot 3 inches. Width, $1\frac{1}{2}$ inches to $3\frac{1}{4}$ inches.

- 2823. ZANZEE. AFRICA.** A slab of wood, on which are attached nineteen metal tongues, fastened at one end, which vibrate over a central rod of iron. These tongues are plucked by the thumbs.

Length, $8\frac{1}{2}$ inches. Width, 6 inches.

- 2759. RATTLE. ZUNI INDIANS, NORTH AMERICA.**

A small gourd attached to a short, wooden handle.

Diameter of gourd, $3\frac{1}{2}$ inches. Length, 6 inches.

- 2847. MARIMBA. CENTRAL AMERICA.** A wooden frame supporting twenty-five bars of wood, beneath each of which is suspended a box-like resonator.

Length, 5 feet 3 inches. Height of stand, 3 feet 6 inches.

IV. CONSTRUCTION CASES.

IV.

CONSTRUCTION CASES.

INTRODUCTORY NOTE.

Under this head are grouped a series of exhibits illustrating each step in the construction of various instruments from the raw material to the completed article. Here one may study the evolution of the violin from a block of Swiss pine; the flute, from a piece of grenadilla wood; and the cornet, from a sheet of brass. The action of the piano is shown in every detail side by side with a completed section; and also the most important forms of actions and pipes in the organ. Detailed information in regard to these exhibits has been furnished by different experts, and may be found in the introductions which preface each series.

I. SERIES ILLUSTRATING THE CONSTRUCTION OF STRINGED INSTRUMENTS.

A. THE VIOLIN.

INTRODUCTION BY A. J. OETTINGER.

There are two kinds of wood used in the construction of a violin: Spruce or Swiss pine for the top (No. 2970), and maple or sycamore for the back (2974) and sides (2977). The neck and scroll (2987) is also made of the same wood as the back (2986). Thoroughly seasoned wood is required, and it is best that the grains of the wood should be on the quarter.

The top and back should be sawed open (2971), and the thick edges glued together. "Backs are sometimes made of one piece." This is a matter of choice. No. 2972 represents a violin top after being glued together in the centre, sawed out, and partly worked. No. 2975 represents a back in the same stage of construction. The zinc pattern (3002) is a guide used in sawing top and back to shape.

The next operation is to work down the outside of the top and back to the archings required. No. 2976 gives an outside view of a back, with the exception that the purfling is not set in at this stage. To produce this result, templates (3004) are used as patterns, and special tools (3009, 3010, and 3011) are required for the work. It is necessary to true up the edges of the top and back to the exact outline of the zinc outside form (3002), and then to gouge a gutter just inside of the edge of the top and back. The top and back are now ready to be reversed, and the inside is to be dug out and graduated. "This is the most important stage of violin construction." Tools (3009, 3010, 3011, 3007, and 3008) are used in this work. The last two numbers (3007 and 3008) are necessary to get the required thicknesses.

The bass bar, No. 2982, is shaped similarly to No. 2983, and is placed inside of the violin top, using No. 3015 for this work.

The sides (2977) are then bent to the shape of the zinc pattern (3002), fitting the sides to the outside of pattern, using a heated iron (3016) for shaping. When shaped, the sides are clamped to form No. 3006; the result will be No. 2979.

The corners and end blocks are then fitted to inside form (3005), and the sides (2979) are glued to the blocks (2984).

Linings (2980) are shaped similar to No. 2981, using the heated bending iron (3016). The ribs, with blocks glued to them, are raised from the form about one-quarter of an inch, so as to allow for gluing on the linings, which come under the back of the violin, without removing the sides from the form. Lining clips (3017) are used for this purpose. The back is now glued to the sides, which are held in place by the corner blocks and one set of linings. The form (3005) is now taken out. The linings are then inserted, which are to lie against the top of the violin, using clips (3017). Sound-holes are cut in the top, using pattern (3003) and tools (3013 and 3012). The top can now be glued on lightly, using No. 3018 for clamping.

No. 3014 is now used to cut grooves inside of the edge of the top and back, and in this is inserted purfling (2988). This has previously been bent to shape over the bending iron (3016), in the same manner as sides and linings were. The violin top is then taken off and the inside smoothed up, and then replaced. No. 2978 represents a finished top before varnishing.

The block (2986) is carved out after the shape of No. 2987. The peg-holes are reamed out, using tool No. 3020. The neck and scroll are then finished up and fitted to the violin, using No. 3019 to clamp the heel of the neck to the button of the back. The violin is now ready to be smoothed down and varnished.

After this work is completed, the trimmings are put on in this order: saddle (2992), finger-board (2990), nut (2991),

and pegs (2996), using No. 3021 in shaping pegs to fit the holes in the neck. End pin (2993), tail-piece (2995), strings (2998-3001), bridge (2997), and sound-post (2985) are then placed in position.

It is advisable to put the violin in perfect playing order and to test it before varnishing, as changes can be made to better advantage. The violin is then tested, and alterations made if found necessary.

In fitting the bridge No. 3022 is used, and in placing the sound-post in position No. 3023 will be found necessary.

Such parts as the bass bar, linings, and blocks are of the same wood as the violin top. Purfling is usually made of holly or maple; the bridge is also maple. The finger-board and tail-piece, nut, and saddle are constructed of ebony. The pegs are either ebony or rosewood. The best strings are those made in Italy of sheep's gut. The G or bass string is made of the same gut, but is wound with silver wire.

BOW CONSTRUCTION.

Pernambuco is the best wood for bows. It is sawed to shape (3027), then formed either round or octagonal, and the curve is given to it after it is shaped, heat being used in this process.

The tip end is shaped, and the frog end is bored and slotted to receive the frog. It is then haired, No. 3037 being used in last-named operation.

The frog of the bow is generally made of ebony, trimmed with German silver or silver. The slide of the frog under which the hair is placed is usually made of mother-of-pearl. The tip is of ivory, and the hair is from a horse's tail.

CATALOGUE
OF
EXHIBITS ILLUSTRATING VIOLIN CONSTRUCTION

CASE 126.

- 2970.** VIOLIN TOP. Wedge-shaped piece of Swiss pine, split from the tree, the grain being on the quarter. The grains will then be perpendicular to the level of the finished top.
- 2971.** VIOLIN TOP. The top sawed open to allow the thick edges to be glued together. The fine grains to be in the centre.
- 2972.** VIOLIN TOP. The top roughly shaped and partly worked.
- 2973.** VIOLIN TOP. The completed violin top, with purfling inserted and bass bar attached.
- 2974.** VIOLIN BACK. Wedge-shaped piece of Turkish sycamore, split from the log, the grain being on the quarter similar to the top.
- 2975.** VIOLIN BACK. The back glued and roughly shaped.
- 2976.** VIOLIN BACK. The completed violin back, with purfling inserted.
- 2977.** VIOLIN SIDES. Strips of Turkish sycamore.
- 2978.** VIOLIN SIDES. The sides smoothed down and bent to proper shape.
- 2979.** VIOLIN SIDES. The sides bent and linings fitted on.
- 2980.** VIOLIN LININGS. Wood, old spruce or Swiss pine.
- 2981.** VIOLIN LININGS. The wood bent to shape.
- 2982.** VIOLIN BASS BAR STOCK. Straight grain spruce or Swiss pine split out.

2983. PATTERN OF VIOLIN BASS BAR.
2984. BLOCKS OF THE VIOLIN. Old straight-grained spruce or Swiss pine. Six pieces: four small ones for the corners, two larger ones for each end.
2985. VIOLIN SOUND POST. Straight-grained spruce or Swiss pine.
2986. BLOCK OF MAPLE from which the Violin Neck is made.
2987. VIOLIN NECK and Scroll ready to be fitted to Violin.
2988. VIOLIN PURFLING, or inlay. Usually made of three strips of holly, two black and one white.
2989. PURFLING bent to shape.
2990. VIOLIN FINGER-BOARD. Ebony.
2991. VIOLIN NUT. Ebony. Placed at the upper end of the finger-board.
2992. VIOLIN SADDLE. Ebony. Inserted in the lower edge of the top.
2993. VIOLIN END PIN. Ebony.
2994. VIOLIN TAIL-PIECE. Gut.
2995. TAIL-PIECE.
2996. VIOLIN PEGS.
2997. VIOLIN BRIDGE. Maple.
2998. VIOLIN E FIRST STRING. Gut.
2999. VIOLIN A SECOND STRING. Gut.
3000. VIOLIN D THIRD STRING. Gut.
3001. VIOLIN G FOURTH STRING. Gut wound with real silver wire and polished.
2969. VIOLIN, completed.

- 3027. BOW. Pernambuco, sawed ready for shaping.
- 3028. BOW TIP. Ivory backed with ebony.
- 3029. BOW SCREW.
- 3030. EYELET connecting Bow Screw with channel of Frog.
- 3038. BOW FROG, incomplete.
- 3035. BOW FROG, complete.
- 3031. BOW FERRULES. Three pieces.
- 3032. BOW SLIDES. Mother-of-pearl.
- 3033. BOW WEDGES. Boxwood; three pieces.
- 3034. PEARL DOT.
- 3036. BOW HAIR.
- 3039. BOW, completed.

TOOLS EMPLOYED IN CONSTRUCTING THE VIOLIN.

CASE 127.

- 3002. PATTERN ZINC for outside and inside of violin.
- 3003. PATTERN for Sound-Holes.
- 3004. TEMPLATES for determining the arches.
- 3005. INSIDE FORM.
- 3006. OUTSIDE FORM.
- 3007. CALIPERS for determining diameters.
- 3008. SCALE for graduating steel.
- 3009. SPOON GOUGE.
- 3010. BRASS PLANES, set of three.

- 3011. GRADING SCRAPERS, set of three.
- 3012. KNIVES with removable blades, set of two.
- 3013. SOUND-HOLE CUTTERS, set of two, with rod.
- 3014. PURFLING TOOL with Awl, double cutters.
- 3015. BASS BAR SETTER. Used in fitting bass bar to violin.
- 3016. BENDING IRON, over which sides, lining, and purfling are shaped.
- 3017. LINING CLIPS, with which the linings are forced into place.
- 3018. FORM CLAMPS used in gluing the top and back to sides.
- 3019. HAND SCREW. Used in gluing button to hole in neck.
- 3020. PEG-HOLE REAMER. Used in shaping the holes in Scroll to Tuning Pegs.
- 3021. PEG SHAPER. Used in shaping pegs to fit the holes.
- 3022. BRIDGE SETTER. Used in shaping the bridge.
- 3023. POST SETTER.
- 3024. VARNISH. One ounce is sufficient for a violin.
- 3025. FILLER. To be applied before varnishing.
- 3026. WOOD showing application of varnish.
- 3037. BOW MACHINE. Used for hairing bows.

For a description of parts illustrating the construction of the Flute, Cornet and Organ, Cases 128-131, see Class II, Wind Instruments, pages 102-107, 112.

B. THE PIANO.

I. The Action, Keys, and Hammers.

INTRODUCTION BY W. E. STRAUCH.

This subject touches a vital part of the instrument with which the musician spends the best portion of his working-hours, and brings out for consideration a part of the piano with which every player should be familiar.

The important rôle which a perfect piano action, key, and hammer play in tone production can best be understood from a careful study of their construction. And by construction it is not intended to mean the method alone, but to include the materials and workmanship. These two mean as much, if not more, to the perfect product as does the mechanical construction, for upon the selection of material as to quality and of the workers as to skill depend largely the results obtained.

ACTION.

What is a piano action theoretically, or, rather, what is the theory of its construction? A piano action is a combination of circles moving in different arcs, so harmonized as to work together without friction, but producing the maximum of power with the minimum of force. The circle being the fundamental principle of the piano action, in the proper scientific application of this principle lies the great secret of a perfect product.

The manufacture of piano actions, both grand and upright, as carried on to-day, has been brought to the height of both a science and an art. A science, in that, through study and experiment, the fundamental principles and rules governing the work have been discovered. An art, in that, by reason of this knowledge and experience, gained through work, hard and never ceasing, it has been made possible to so apply these

principles and rules as to produce the most perfect results in the three great objective points of a perfect action—an easy, free touch, rapid and accurate repetition, and durability. Open the piano, depress the key, and see the study which you have before you in applied mechanics of the highest type. Each action, no matter how simple, has two conflicting circles. An examination of a grand or upright piano action shows these two circles moving in opposite directions in four positions: the key describing the first, the wippen the second, the fly, or jack, the third, and the hammer the fourth. Yet these four points or circles are so brought together as to allow of the greatest freedom and rapidity of action with the minimum of friction; so small, in fact, that it is impossible for it to be felt by even the most delicate touch.

Experience has taught that, of all woods most fitted for use in actions, our native rock maple is the best. This is carefully selected at the mills where cut, and then piled in the open air for at least two years to become properly air-dried, the best method of lumber drying. It is then put in drying-rooms, where it lies from two to four weeks in a temperature of from one hundred and eighty to two hundred degrees. In addition to maple, birch, cherry, mahogany, white holly, rosewood, cedar, white pine, and basswood are used, all of which pass through the same process of drying. The lumber then passes to the machines, where it is cut in lengths, trimmed, and planed preparatory to being glued up for moulding. Since three different grains of the wood—namely, silver, half-silver, and straight—are used, great care must be given to the proper selection of the wood with reference to the grain for the particular part of the work for which it is to be utilized, careful attention being given at the same time to the matching of color and figure. After being cut up in the proper widths for mouldings, it passes to the moulder, through whose machines a single piece has to go from two to eight times before being finished. It is now taken to the cleaners and polishers, where every part of each piece of action is scraped and sand-papered, some parts being French polished. From here it goes

to the machines where the different mouldings are cut, bored, frazed, and grubbed. Special machinery has been designed for the various processes of this class of work, and so accurately are the parts made that those of similar pattern are perfectly interchangeable.

The work is now ready for assembling and finishing, and is taken to the several departments on the finishing floors, where the bushing, covering, pinning, frame-making, setting up, and finishing are done. In these departments the utmost skill and experience are demanded, for, no matter how perfect the preceding work may have been, the following operations are so delicate that the slightest inaccuracy will spoil the entire work beyond repair. The bushed centres are the most sensitive of all parts in the action and most quickly affect the work of a piano. In the highest grades of actions, only the finest and most expensive cloths manufactured in Europe and America are used in these centres. Their sensitiveness to atmospheric changes makes it necessary that every precaution be used to have them as absolutely proof as possible against these changes; for a sticky action is of all things to be avoided. Even sluggishness will so affect the touch as to render a piano entirely useless for artistic purposes, since it destroys the repetition and makes the touch heavy. Hence the great care in the treatment of the centres.

The parts to be bushed are first machine bored, and placed side by side; through the corresponding holes in the similar parts there is drawn a piece of cloth, of such thickness and width that a single coil completely fills the hole. These parts are glued, and later cut apart and trimmed. Finally, the bushings are needled, each pin being centred, and tested so that it shall be neither too tight nor too loose. The parts are now ready for assembling, after which they pass to the finishers, who mount them on the frames, examining each piece as it passes through their hands, as a final precaution against any imperfections.

Many improvements have been introduced in piano actions during the past few years to make the touch light and free, the

repetition perfect, and the action strong and durable; but the most important of all has been the "lost motion attachment" for the perfecting of the action when the soft pedal is used. In the old style action, when the soft pedal was used, a lost motion was felt between the keys and the action which makes the touch unpleasant under the fingers of the performer. With the new attachment when the soft pedal is used the same depth and feeling of touch are retained, and the musician is assured of absolute control of the action at all times.

KEYS.

The keys follow through a similar course from the selection and drying of the lumber and ivory to the final finish. The choicest pine, white, perfectly clear and straight-grained, has to be selected to stand the great strain put upon the keys when playing. They pass through the same course as the action from the cutting and gluing of the lumber to the finishing of the keys. Just as great care must be used in the selection and working of the bushing as in the action, and for the same reason and to obtain similar results.

IVORY.

In the majority of pianos only ivory keys are used. This ivory, most of which comes from Africa, is imported in tusks, weighing from fifty to one hundred and twenty-five pounds. That used in piano keys must be specially selected. It is cut up into two small sizes, one piece for the head, or wide front top of the key, and the other for the tail, or narrow rear top of the key. After cutting, the pieces go through a process of cleaning, and are bleached in the sun for a month. Afterward they go to the matchers, where the heads and tails are matched up into sets for a keyboard, care being taken to have each tail match its own particular head, and all to match together for color and grain. The sets are then thoroughly dried, and made ready to be glued on the keyboard.

HAMMERS.

The felt-covered hammers are the parts which come in contact with the strings to produce the tone. These have a core of wood called the "hammer head," over which the felt is tightly drawn and glued down. In the quality of the felt used lies, to a large extent, the tone quality of the piano. The finer the felt in quality, the sweeter the tone.

The action, key, and hammer having been supplied, the piano-maker's work begins, and with him lies a large responsibility for the results to be achieved. Thorough skill in the piano-maker is as necessary as perfection in action, key, and hammer, if pleasing results are to be attained in playing.

CATALOGUE
OF
EXHIBITS ILLUSTRATING THE CONSTRUCTION
OF THE PIANO.

I. The Action, Keys, and Hammers.¹

THE GRAND PIANO.

CASE 132.

3183. HAMMER RAIL.
3184. WIPPEN RAIL.
3185. DAMPER LEVER RAIL.
3186. DAMPER LEVER SWING RAIL and spring.
3187. DAMPER LEVER STOP RAIL.
3188. REGULATING RAIL, with screws, buttons, and punchings.
3189. DAMPER HEAD with wire, complete.
a. Moulding. *b.* Damper head for single bass string. *c.* Damper head for double bass string. *d.* Damper head for triple bass string. *e.* Damper head for treble strings. *f.* Felt for dampers. *g.* Bass damper felt, single string. *h.* Bass damper felt, double string. *i.* Bass damper felt, triple string.
3190. DAMPER LEVER, complete.
a. Damper lever. *b.* Patent top flange. *c.* Sustaining tongue. *d.* Lower flange. *e.* Lever lead. *f.* Stud and screw. *g.* Regulating screw for sustaining top flange. *h.* Spring for sustaining tongue.

¹ This exhibit of piano actions, keys, and hammers, Cases 132 and 133, was presented by Messrs. Strauch Bros., New York, N. Y.

3191. SUSTAINING ROD.
a. Post for Sustaining Rod.
3192. BRASS WASHERS.
3193. GRAND ACTION PARTS, complete, ready to screw on to frame.
A. Grand action parts assembled: *a.* Support. *b.* Repetition lever.
c. Loop flange for repetition lever. *d.* Support flange and screw.
e. Top support flange. *f.* Jack stop. *g.* Jack. *h.* Jack tender.
i. Hammer shank. *j.* Hammer shank flange. *k.* Butt. *l.* Hammer head. *m.* Back check. *n.* Back check wire.
B. Grand action parts assembled, machine work complete.
3194. DAMPER LEVER BRACKET.
3195. ACTION BRACKET.
3196. MODEL of Grand Piano Action.

THE UPRIGHT PIANO.

3197. MAIN RAIL, with brass flange rail, damper head, and regulating rail brackets attached.
3198. HAMMER RAIL.
3199. EXTENSION RAIL.
3200. SPRING RAIL.
3201. STOP RAIL.
3202. REGULATING RAIL, with screws, buttons, and punchings.
3203. DAMPER ROD.
3204. SUSTAINING ROD.
3205. LOST MOTION ROD.
3206. BRASS FLANGE RAIL, with bolts and screws.

3207. TREBLE DAMPER FELT, ready for covering.
a. Bass damper for single string. *b.* Bass damper felt for double string. *c.* Bass damper felt for triple string. *d.* Set of dampers. *e.* Felt punchings.
3208. BUSHING CLOTH and silver centre-pin.
3209. BRIDLE.
3210. UPRIGHT BRACKET with bolts.
3211. UPRIGHT ACTION, complete, ready to screw on to frame.
A. Upright Action parts: *a.* Wippen. *b.* Wippen flange. *c.* Jack flange and spring. *d.* Jack. *e.* Extension. *f.* Lost motion extension. *g.* Lost motion lever. *h.* Extension guide flange. *i.* Extension guide. *j.* Butt and swing rail spring. *k.* Catcher and shank. *l.* Hammer shank. *m.* Hammer head. *n.* Back check and wire. *o.* Sustaining rod flange and spring. *p.* Damper lever and wire. *q.* Lever flange and spring. *r.* Damper block. *s.* Damper head moulding. *t.* Bridle wire. *u.* Stop rail regulating screw. *v.* Spoon. *w.* Sustaining wire.
B. Upright action parts assembled, machine work complete.
3212. MODEL of Upright Piano Action.
1229. SECTION OF KEYBOARD. One octave: keys mother-of-pearl; sharps inlaid.

CASE 133.

THE SQUARE PIANO.

3213. DAMPER LEVER STOP RAIL.
3214. DAMPER FLANGE RAIL.
3215. WREST PLANK.
3216. BUTT FLANGE RAIL.
3217. HAMMER REGULATING RAIL.
3218. DAMPER PROP.

3219. ACTION PROP.**3220. SQUARE ACTION** parts, machine work complete.

A. Square Action parts: *a.* Bottom. *b.* Jack. *c.* Spring with thread. *d.* Butt flange. *e.* Butt. *f.* Hammer shank. *g.* Hammer head. *h.* Back check. *i.* Lever. *j.* Lever flange. *k.* Damper moulding. *l.* Lifter. *m.* Punchings and buttons.

3221. MODEL of Square Piano Action.

PIANO KEYS.

3222. HAMMER FELT for covering.**3223. UNDER FELT** for covering.**3224. HAMMER HEADS**, square piano action.

a. First bass. *b.* Last bass. *c.* First treble. *d.* Last treble.

3225. HAMMER HEADS, grand piano action.

a. First bass. *b.* Last bass. *c.* First treble. *d.* Last treble.

3226. HAMMERS, bored and wired, grand piano action.

a. Hammer wire.

3227. HAMMER HEADS, upright piano action.

a. First bass. *b.* Last bass. *c.* First treble. *d.* Last treble.

3228. HAMMER HEADS with under felt. Upright Piano action.**3229. HAMMERS**, bored and wired. Upright piano action.**3230. MAPLE** and cedar hammer shanks.**3231. TAIL STOCK.****3232. HEAD STOCK.****3233. IVORY** narrow tail.**3234. IVORY HEAD.****3235. IVORY** wide tail.**3236. KEY BLOCKING.****3237. SHARP.**

3238. KEY BUTTON.

3239. POINT of ivory tusk. Weight of tusk $78\frac{1}{2}$ lbs.

3240. MIDDLE of tusk.

3241. BUTT of tusk.

3242. UPRIGHT PIANO KEY, complete.

a. Capstan screw. *b.* Balance rail pin. *c.* Front rail pin.

3243. UPRIGHT PIANO SHARP.

3244. ORGAN KEY.

3245. ORGAN KEYS, four manual organ.

For description of Nos. 3409, 3410, 3411, see page 100.

C. THE PIANO (Continued)

II. The Skeleton, Sounding Board, Iron Plate, etc.

INTRODUCTION BY WILLIAM RUHENBECK.

Pianofortes are made in three different forms: the grand, pentagonal in form, and placed horizontally on three supporting legs; the square, rectangular, supported by four legs; and the upright, built vertically for economy of space. In preparing the following description, which deals with the form most generally in use, the upright, the aim has been, as far as possible, to eliminate details, and to make the technical matter not only clear, but of interest to the casual reader.

In no industry has science proved of as little help as in that of piano building, and in no field do theory and practical result differ so widely. While it is true that, in every step in the construction of the piano, attention must be paid to the laws of acoustics, the proper application of these laws is still an unsolved problem.

SCALE.—The first step in the construction of the piano is the draughting of the scale. The scale ordinarily means a working drawing, and is to the piano-maker what the architect's plan is to the builder; although the term "scale" is sometimes used by him to indicate the tone volume and quality of an instrument. The successful scale draughtsman of to-day must not only have a thorough knowledge of every detail of piano-building, but he must also understand the art of metal casting, since the iron plate forms a very important feature in the modern piano. His own experience and that of his predecessors and fellow artisans are his best text-books; and fortunate is he who, with unbiased judgment, can appreciate the achievements of others and profit by his own errors.

In preparing the scale, a full-sized drawing is made, giving the dimensions of the instrument to be constructed. A line, called the "hammer-line," is then drawn parallel to the top, indicating where the hammers will strike the strings, and on

this line is noted the position of the braces which strengthen the plate and divide the strings into groups or sections. In the upright form of piano, the bass section usually contains about two octaves; the middle and treble, three octaves each. After marking off the space required for these braces, the remainder of the hammer-line is divided into eighty-eight even parts for a seven and one-quarter octave piano, allowing a little more space for the thicker bass strings. The direction in which the strings are to be placed is now considered, and this is indicated in the drawing. In the modern piano, the bass strings are placed diagonally over the strings of the centre section, thereby increasing the length of string and centralizing the location of the sounding-board bridge. By this arrangement a better tone is obtained than when the bridge is placed near the edge of the sounding-board; it also allows a more even distribution of the strings. When these points have been decided upon, the length of the strings must be defined; and by "string length" is meant simply that part of the string which vibrates. In order to gain a certain character of tone, the string has to be struck in a fixed fractional part of its length. A variation in either direction changes the tone. The draughtsman now takes middle C or A, and, having determined the character of the tone, places the shorter fraction of its string above, and the longer below, the hammer-line. For example: where middle C is twenty-four inches long, and the striking point is to be in the eighth part, three inches would be placed above and twenty-one inches below the hammer-line. The length of the string of the keynote governs that of the other strings; but in the first two and a half octaves of the bass, where the size of the case limits the length of the string, the desired tone is obtained from a shortened string by the use of heavy overspun wire. As the strings advance toward the treble, they should, according to theory, decrease in length one-half to each octave; but in practice, the length is decreased a trifle less than half. The points are then indicated above and below the hammer-line which give the outline of the two bridges: the wrest-plank bridge at the top, over which the

strings pass to the tuning-pins, and the sounding-board bridge below, where the strings are fastened to the hitch-pins. The distance between these two bridges defines the vibrating length of the string: this varies, as above stated, decreasing as the strings approach the treble. The plate, sounding-board, and skeleton are next drawn in detail, after which the minor points are added, and the scale completed. A description of these items would, however, prove tedious, and the salient features will be considered in the paragraphs descriptive of the practical construction of the instrument.

CONSTRUCTION.—The principal raw materials used in piano-making are: wood, iron, steel, brass, ivory, wool, leather, glue, varnishes, etc. The most important of these is the wood, and in its selection and preparation extraordinary care is exercised. After a tree is sawed into the required dimensions, it is left exposed to the weather for from three to ten years, according to the nature of the lumber; it is then placed in a drying room, where it is subjected to artificial heat for a number of weeks, after which it is stored in a dry, warm place until used.

The piano may be divided into three principal parts: the *back*, comprising the skeleton or frame, wrest-plank, sounding-board, iron plate, and strings; the *action*, consisting of the hammers, keys, dampers, and action proper; and the *case*, which is the exterior woodwork, and chiefly ornamental.

SKELETON.—The skeleton (Plate I, A) consists of stout pieces of wood, framed together so as to form a support or bed for the sounding-board (Plates I, II, B), and, in conjunction with the metal plate (II, C), is designed to resist the strain of the strings. On its face, near the top, the wrest-plank (I, D), or pinblock, is glued, and in this the tuning-pins (II, E) are inserted. The enormous strain to which the wrest-plank is subjected necessitates great care in its construction. It is made of several layers of rock maple, glued together at different angles, and in preparing the wood it is sawed in such way that the tree cells lie at right angles to the penetrating

tuning-pins; the grain (called silver grain) in this position offers the greatest resistance to splitting. Below the pin-block, the upper edges of the skeleton are faced with a strip of maple one and one-quarter inches in width, and to this the sounding-board is glued.

SOUNDING-BOARD (I, II, B).—After numerous experiments with other materials, aluminum included, carefully selected, clear spruce has proved the only satisfactory wood for the sounding-board. This is cut into strips from three to five inches in width and half an inch in thickness, and after proper seasoning these are glued together, planed to nearly the desired thickness, and stored in a warm, dry place. Before being used, the wood is again subjected to heat, at first moderate, but gradually increasing to a high temperature. It is then planed to the exact thickness specified in the scale. The average thickness is about three-eighths of an inch in the treble and one-quarter of an inch in the bass. The exact thickness and the direction of the grain of the sounding-board are optional with the maker. In the first half of the last century, the sounding-board was so adjusted that the grain of the wood ran diagonally from the upper bass to the lower treble corner; but it has been found that a much better quality of tone is obtained if the grain runs more nearly parallel to the sounding-board bridge; and for this reason, in the sounding-board of the modern piano the grain of the wood generally runs from the upper treble to the lower bass corner, directly the reverse of the former method. The ribs (I, O), from nine to sixteen in number, are now shaped, and glued to the back of the sounding-board at points indicated on the scale, and are so placed that the grain of the wood in the ribs is at right angles to that of the sounding-board. This is then treated with a specially prepared varnish, and the sounding-board bridge (I, II, F) attached. This bridge is in two parts: the longer (I, II, F), which carries the middle and treble sections of the strings, is placed diagonally from the lower left-hand to the upper right-hand corner; the shorter (II, FF) (some-

times called the bass bridge), lies in the same direction, but below the other, is much thicker, and carries the heavier bass strings. This bridge is cut from silver grain rock maple. A great deal of wood is wasted in obtaining a solid bridge of this grain, but it is much more durable than a bridge composed of layers of veneer with a capping of rock maple, an inferior method which is sometimes employed. The iron plate is now fitted, and the bridge planed flush to its surface. The plate is then removed, and the location of the bridge-pins (II, G) indicated from a pattern. The holes for the pins are then bored, the top of the bridge polished with graphite, its edges cut away to allow the free vibration of the strings, and the pins inserted in two rows.

IRON PLATE (II, C).—This is cast from an iron model, made one-eighth inch larger than the finished plate to allow for the shrinkage of the molten metal in cooling; and this iron model is itself cast from a wooden pattern one-quarter inch larger than the finished plate, which allows for a similar shrinkage of the iron model in cooling. Great care, therefore, must be exercised by the draughtsman in indicating the size of the wooden model in the scale. After the plate is cast, holes are bored for the screws, bolts, tuning-pins, and hitch-pins in places indicated on the pattern furnished by the draughtsman, and it is then ready to be japanned, bronzed, and varnished, and finally bolted into place.

WREST-PLANK BRIDGE (II, H).—In the model here described, the wrest-plank bridge is, in the bass section, cast as part of the plate. In the middle and treble sections, however, it is formed by a narrow strip of wood with a wire inserted in its rounded surface, screwed to the plate.

STRINGS.—The strings are of steel wire of varying thickness. The thinnest are in the treble, and they increase in size as they approach the bass. The required tension and tone in the bass are obtained by the use of overspun wire (steel wire covered with a spinning of either soft iron or copper wire).

Each note or unison consists of three strings, except in the lower bass, where, because the thicker strings require more space, only one string is used for each note in the first eight to eleven notes, and two strings each for the following ten to eighteen notes, according to the scale-maker's specifications. Different methods are employed in stringing. In some cases, each string has its own hitch-pin, as in the bass strings of this model; while in others, as in the treble section, one hitch-pin (II, G) serves two strings, in which case the string passes around the hitch-pin instead of being fastened to it, and is carried back over the wrest-plank bridge (II, H) to the tuning-pin (II, E), around which it is coiled. When all of the strings are placed, a metal bar is screwed down on the strings of the middle and treble sections, back of the wrest-plank bridge; this is called the capo d'astro bar (II, J), and serves, with the two rows of bridge-pins (II, G), sharply to define the vibrating part of the strings. The strings now receive their first tuning by picking them with a small stick and turning the tuning pins until each attains its proper pitch. The back is now ready to be placed in the case.

ACTION (II, K).—The instrument is now ready for the adjustment of the action, the different parts of which are mounted on rails and fastened to metal brackets (II, L), which are, in turn, fastened by bolts to the metal plate and key-bottom. The action is so placed that the points at which the hammers strike the wires correspond exactly to the points indicated in the scale. The hammers vary in size, being small in the treble and increasing in dimensions as they approach the bass. They are made of small, flat pieces of wood, pear-shaped, the narrow edge covered with two layers of wool felt: this forms the hammer-head, which is glued on a round shank of maple and inserted in the hammer-butt. When first adjusted, the tone produced by the hammers is very hard and metallic, but after passing through the hands of the finisher a melodious and rounded tone is obtained. This detail is known as "voicing" the hammers, and requires wide experience. The dampers are

next adjusted, their function being to silence the strings when the keys are not depressed. After the hammers and other parts of the action are adjusted, the keys (II, M) are placed, each of which is brought in touch with the action by means of a capstan screw (II, N).

CASE.—This, like the other parts of the instrument, is constructed from accurate drawings. The different parts having been worked into the desired dimensions, each side is overlaid with two coverings of veneer of such wood as may be desired, mahogany, walnut, and oak being used extensively. The veneer not only prevents the wood from warping, but it gives a better finish. It is cut in thin sheets one-twelfth to one-twenty-fourth of an inch in thickness. The first is so laid that the direction of its grain is at right angles to that of the foundation. Glue is applied to the solid wood, and the veneer laid on, over which a heated board is placed, and pressure applied by clamps, etc. This remains for half a day or more, and when thoroughly dry it is evened out, and the final veneer laid on. This latter veneer is of carefully selected wood, and the grain runs the same as that of the solid wood, or at right angles to the first layer of veneer. After the glue has thoroughly hardened, it is ready for sandpapering, carving, and other ornamentation, when it passes into the hands of the varnisher, who, before applying the first coat, matches up the grain and coloring of the wood to produce a uniform effect. Five to seven applications of varnish are made at intervals of two weeks, and, when this is thoroughly dry, the surface is rubbed down with ground pumice-stone and water and cloth-covered blocks, after which a final coat of varnish is applied.

The action and case complete, the instrument now passes into the hands of the finisher, who regulates the action, voices the hammers, gives the instrument its final tuning, and examines every part for any possible defect. The piano then leaves the hand of the maker and enters on its mission.

CATALOGUE
OF
EXHIBITS ILLUSTRATING THE CONSTRUCTION
OF THE PIANO (Continued).

II. The Skeleton, Sounding-Board, Iron Plate, etc.

CASE 133.¹

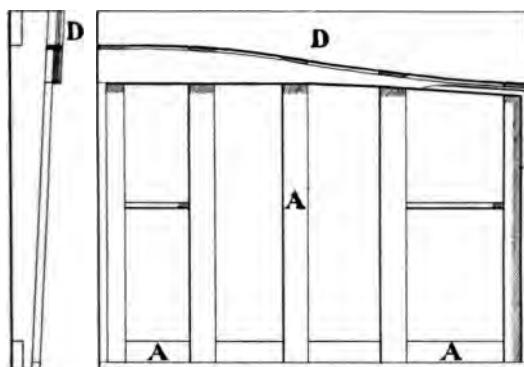
3409. MODEL of Skeleton for Upright Piano.
3410. MODEL of Sounding-Board for Upright Piano, showing position of the sounding-board bridge and bass bridge.
3411. MODEL of Skeleton for Upright Piano, showing sounding-board and ribbing in place.

For description of the other exhibits in this case, see page 90.

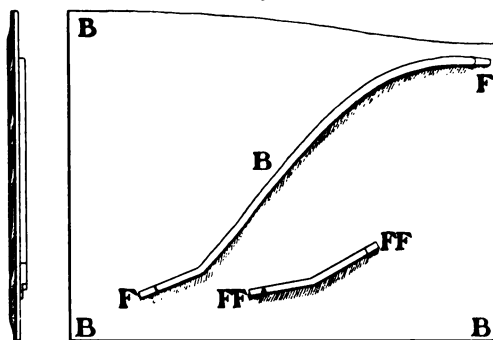
CASE 134.¹

3294. UPRIGHT PIANO, without case, showing interior construction, with treble section of action in place.
a. Skeleton. *b.* Sounding-board. *c.* Metal plate. *d.* Wrest-plank or pinblock. *e.* Tuning-pins. *f.* Sounding-board bridge. *g.* Bridge pins. *h.* Wrest-plank bridge. *i.* Capo d'astro bar. *k.* Section of action. *l.* Metal brackets. *m.* Keys. *n.* Capstan screw.
3111. MODEL of Steinway Grand case, showing old construction of rim and old method of bracing.
3108. MODEL of Steinway iron string-frame, showing three-quarter iron string frame with wooden wrest-plank.
3109. MODEL of Steinway iron string-frame, showing full iron string-frame covering wrest-plank.
1924. MODEL of Repetition Action, Steinway Grand, showing balance lever.

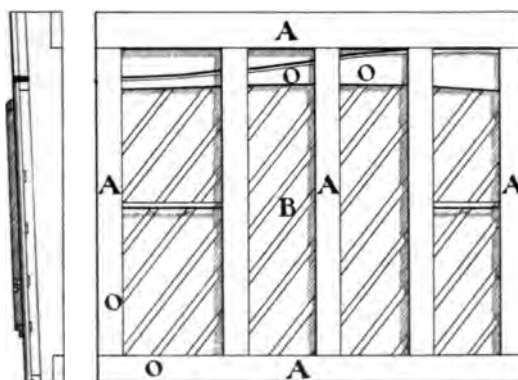
¹ Nos. 3409, 3410, 3411, 3294, presented by Mr. William Ruhenbeck, New York.



3409



3410



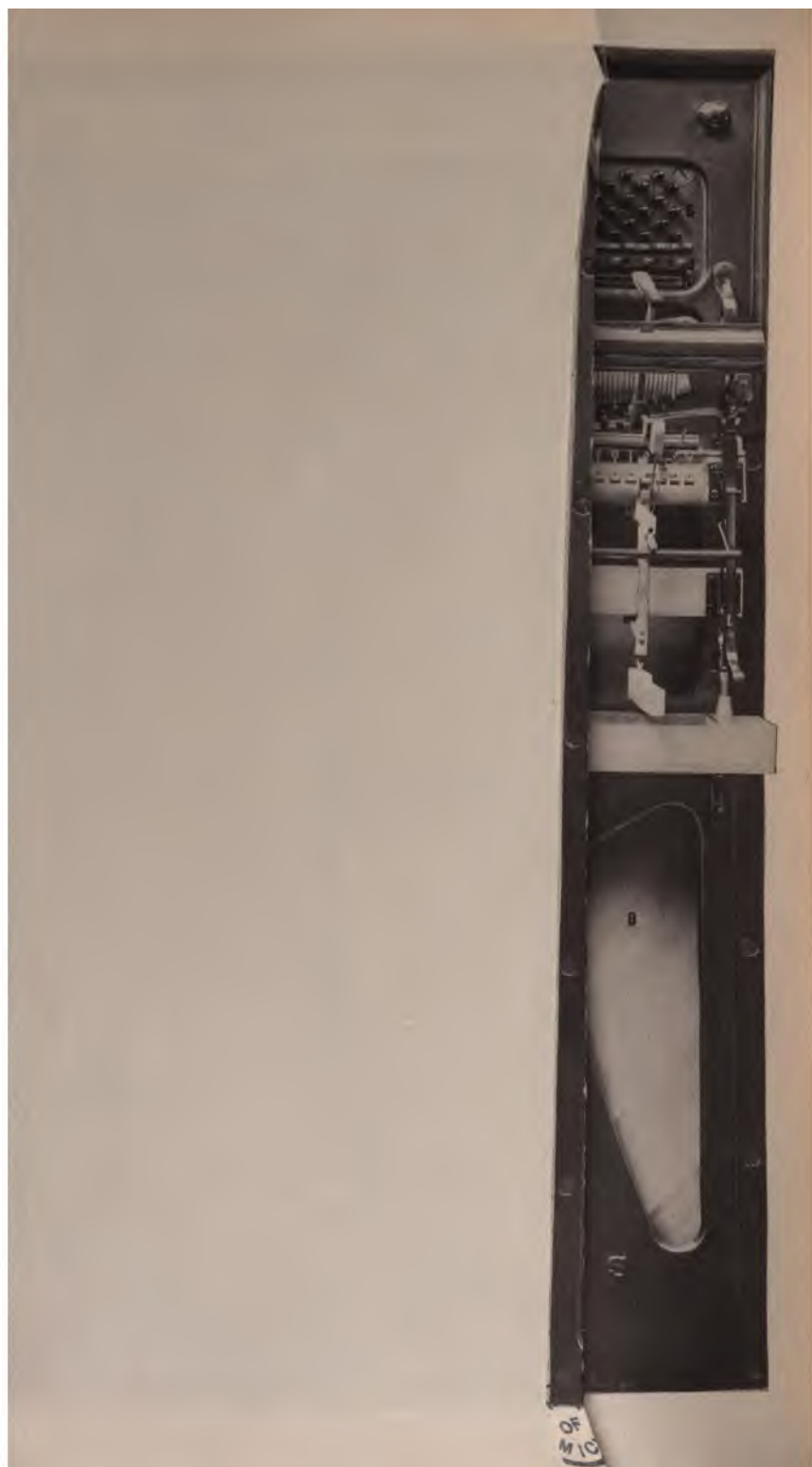
3411

PIANO CONSTRUCTION.

Plate I.

Models of Skeleton of Upright Piano.

Page 100.



CASE 135.

- 3112.** MODEL of Steinway grand case, showing modern bent rim, modern method of bracing, and iron shoe connecting same with plate.
- 3110.** MODEL of Steinway string-frame, showing modern full iron string-frame, with capo d'astro bar.
- 3114.** MODEL of Steinway sounding-board, showing ribbing.
- 3113.** MODEL of Steinway sounding-board, showing bridge and bass ridge.
- 3116.** MODEL of Chickering case, showing the Chickering system of wooden bracing for grand pianos.
- 3115.** MODEL of Chickering frame, showing the overstrung frame for square piano.
- 1926.** MODEL of Clavichord Action.

Nos. 1924, 3108-3116, presented by Messrs. Steinway Sons & Co., New York.

For description of Nos. 1386, 1573, 2817, 3137, see page 133.

For other models of piano action, see page 137.

II. SERIES ILLUSTRATING THE CONSTRUCTION OF WIND INSTRUMENTS.

A. THE FLUTE.

INTRODUCTION BY HARRY BETTONEY.

The flute, described below, commonly known as the German flute, is an elaboration of the ancient one-keyed flute or fife. It comprises four sections or pieces respectively: the first or head piece, metal lined, in which the sounding or blow hole is made; the second piece, also metal lined, which forms a movable slide with the first piece, called a tuning slide, and is used to alter the pitch of the instrument; the third piece, in which the holes covered by the first fingers of the left hand are placed; and the fourth piece, used by the right hand. The first and second pieces are bored cylindrically, the third and fourth pieces conically, tapering to a small hole at the extreme end of the fourth piece.

Flutes are made of Grenadilla, Ebony, Cocus, or Rosewood. Grenadilla, however, is generally used, and is obtained in logs varying in diameter from eight to eighteen inches, in length from eighteen inches to four feet. It is cut in the lengths required (3040), then split or sawed, and hewn to the proper diameter in the shape of the block (3041).

The next process, boring the hole, is done immediately, to avoiding cracking. This is prevented by running the hole through the center. One end of the block is placed in a chuck, and the hole is drilled from the other end, extending the entire length. The drill is followed by the smallest reamer (3055), which has to be withdrawn at frequent intervals to remove the refuse and to apply a thick oil on the tool. A larger reamer is then used, making the diameter of the hole approximately within one-sixteenth inch of its size when finished (3042). The block is then placed between centers, and its outer diameter is turned down to within one-fourth inch of its ultimate size and shape (3042). The next process is

the drying, seasoning, and oiling of the wood. This is done by placing it in a warm, airy spot until all traces of sap have disappeared, and then immersing it in a vat of oil, where it remains from one to three months.

The rings and keys are made of silver, or German silver, the latter being generally used.

The pieces are then bored their correct size, the cylindrical reamers (3055) being used for the first and second pieces, the taper reamer for the third and fourth pieces. The metal linings (3044) used in the first and second pieces are cylindrical; they are heated and inserted in their respective pieces when very hot, a solution of resin and beeswax being used to hold the metal firmly to the wood; the metal tube of smallest diameter is used in the first piece, and it extends through the second piece to the socket; the larger tube is used in the second piece, and fits tightly over the metal tube, which extends through the first piece, forming a movable slide. The outer diameters of the pieces are then turned to their proper dimensions, and smoothed with fine sandpaper.

The pieces are next cut to their correct lengths, which are determined by the gauges (3054) for the finger holes. The gauge on the left of the exhibit shows the length the first and second joints should have when finished. The third piece, used by the left hand, must have a projecting joint, approximately one inch longer than is given on the center gauge in the exhibit; this joint is fitted in the socket of the second piece as tightly as possible, slight indentations being cut in the joint to allow thread or cork to be wound or fastened in such a manner as to make the sockets fit tightly, rendering the whole tube of the flute air tight. When the cork is used it is fastened on the joint with shellac, the cork being bound and fastened in its place by cord until secure, then fitted to its socket, a razor and sandpaper being used to trim the cork. On the third piece another joint extends beyond the gauge, and fits in the fourth piece in the same manner.

The ferrules (3048) for the various pieces are made from strips of metal (3050), which are bent in a circle, soldered

together, hammered into circular shape on an arbor, turned into the desired shape, and fitted tightly on the wood.

The finger holes and holes for keys and pillars (3049 D) are next bored in the places denoted by the gauge for the finger holes (3054), by means of the drills (3057).

The plug (3054) is made of wood or hard rubber, and threaded on both ends: on the outer or thick end is placed a circular disc with screw; the thin end is fastened in a solid piece of cork, which is turned to fit the bore of the metal lining (3044) in the first piece of the flute. After the cork is fitted tightly in its place in the first piece, the screw serves the purpose of adjusting the cork plug at its correct distance from the blow hole. The metal ornament, or cap, is fastened to the disc or plug either by spinning or riveting; the metal ornament on the end of the fourth piece is fastened in the same manner.

The metal used for the keys is hammered, flattened, and roughly shaped from round rods of different diameters and filed into shape. The round caps on the end of the keys are punched from sheet metal and shaped by dies or turned in a lathe from rods, being soldered on their respective keys.

The pillars (3049 D) are shaped from rods and threaded on one end in order to screw firmly into the wood. Springs (3058) are made of steel or German silver, and are hammered and filed into shape; screws (3059) for tubing are made of steel rods threaded on one end. German silver tubing is drawn of the desired dimensions.

The pillars (3049 D) are then placed in their correct positions, the holes in the wood being prepared by tapping threads. When the pillars are tightly fastened, the screw holes are drilled into them at right angles with the wood, the hole in the further pillar being threaded for the screw (3059). The inner parts of the pillars, where the tubing on the key fits, are flattened by means of a file or cutter in order to present a surface to the wall of the tubing.

The keys are filed in shape and fitted to their respective positions covering the holes; the spot where the metal tube

(3051), used as a fulcrum in each key, is to be placed is determined by placing the cup of the key over the hole it is to cover, and marking the place for the tube on the key with wire through the screw holes in the pillar. A hole is then drilled in each key; the tubing (3051) fitted tightly and soldered therein, and fitted between the two supporting pillars, and the bore of the tubing reamed with drills (3056) to fit the screws (3059).

When the keys are fitted in their places, the springs are adjusted and fastened on the keys with screws or rivets, the keys washed in a thin solution of sulphuric acid, cleaning the metal of all discolorations and foreign substances, smoothed with fine sandpaper, buffed, polished, and finally washed in a solution of ammonia. The wood is then polished with an oily polishing substance of the nature of putz pomade.

In low or International pitch flutes (435 vibrations to concert A), the center of the blow hole should be $11\frac{5}{8}$ inches from the center of the hole covered by the third finger of the left hand. The blow hole is first made with a small drill, approximately one-fourth inch in diameter, then cut the desired size and shape with a sharp graver or knife. The surface of the cork plug in the first joint is adjusted .65 of an inch from the center of the blow hole.

The caps (3049 B) on the ends of the keys are provided with pads or cushions (3049 C) made of leather and flannel, which close the holes, making them air tight when the keys are closed; they are firmly fixed to the key caps with resin, sealing wax, or shellac in thin solution.

The keys, which are adjusted in such a manner as to be raised not more than one-fourth inch from the holes when open, are prevented from making clicking sounds and marring the surface of the wood by strips of cork of varying thickness, fastened on the necessary parts of the keys with shellac, and trimmed with a razor and coarse sandpaper.

The four pieces are finally fitted together, the cork joints and tuning slide lubricated with a hard grease of the nature of tallow, and the instrument is ready for use.

CATALOGUE
OF
EXHIBITS ILLUSTRATING THE CONSTRUCTION
OF THE FLUTE.

CASE 128.

3040. BLOCK of Brazilian Grenadilla Wood.
3041. SECTION of Grenadilla wood shaped ready for boring.
3042. JOINTS turned and bored.
3043. MIDDLE JOINT split open to show the bore.
3044. METAL LINING.
3045. PLUG.
3046. JOINTS with lining and keys in place.
3047. JOINTS bored for the keys.
3048. FERRULES for joints and ends.
3049. SET OF KEYS in the rough.
a. Key lever. *b.* Cap. *c.* Cushion. *d.* Pillars. *e.* Saddle.
3052. SET OF FINISHED KEYS.
a. D sharp. *b.* F trill. *c.* B natural. *d.* B natural. *e.* B sharp trill. *f.* B natural trill. *g.* B natural. *h.* F natural. *i.* low C. *j.* D sharp.
3050. GERMAN SILVER.
3051. GERMAN SILVER TUBING used for hinged joints.
3058. SPRINGS for keys on flute.
3059. SCREWS for tubing on flute keys.
3053. COMPLETED FLUTE.
- TOOLS EMPLOYED IN CONSTRUCTING THE FLUTE.
3054. GAUGE for finger holes.
3055. REAMERS for boring joints. Set of four.
3056. DRILL for boring pillars.
3057. DRILLS for the finger holes.

B. THE CORNET.

INTRODUCTION BY CARL L. W. NELSON.

The metal selected for making cornets is Trumpet Brass, generally made up according to a special formula.

The Bell part is cut out from sheet brass (No. 3060), bent and jointed (No. 3061), laid with brass spelter and brazed together, forming a strong seam (No. 3062), which is hammered to a thickness conforming to the sheet brass itself.

The flare or bell part is annealed and hammered repeatedly on an iron mandrel (No. 3102) until it assumes the required shape. It is then driven on another mandrel (No. 3093) and spun to a perfect fit. The edges forming the rim are spun over wire, the inside and outside of the flare being finished smooth. The full length of the bell, after being filled with lead is bent to shape and hammered perfectly round (No. 3064), the lead is melted out and the surface finished ready for assembling (No. 3088, part A).

The pistons (B) are mostly made of German silver tubing cut into lengths. They are put into a jig or casing to bore port holes; the tubings or ports are soldered in their proper places; the faces of the pistons are turned to a size and made perfectly straight in a lathe; the tubes for the springs are adjusted and soldered on (No. 3083) the valve springs (No. 3082), which are wound to conform to the weight of the piston and to the space allotted between the carrier and the adjusting screw.

The cylinder cases (No. 3081) are made from drawn tubing, holes being drilled for slides or pumps, and also for connecting air passages. They are put into a jig with proper sized and shaped ports and all parts are hard soldered together, forming a connected valve casing. The cylinder linings (No. 3080) have the holes bored in a jig the same as the cases, and are then inserted and soft soldered into position.

The upper valve-cap (No. 3084), the lower valve-cap (No. 3079), and the finger buttons on top of the pistons are made from castings, or are turned from solid brass rods on a turret lathe. (See assemble exhibit B, C, and E.)

The stays or braces (F) are turned to shape and length. The flanges are stamped out and hard soldered to the stay, forming a very strong support when properly fitted.

The one-tone slide is made up from a knuckle (No. 3073) and inside and outside tubes (No. 3070), soldered together and attached to the first piston, which is manipulated by the first finger. (See assemble exhibit No. 3088 G.)

The one-half tone slide is made up from a knuckle (No. 3073) and inside and outside tubes (No. 3069), soldered together and attached to the second piston (No. 3083), which is manipulated by the second finger.

The one and one-half tone slide is made up from a knuckle (No. 3073) and inside and outside tubes (No. 3071), soldered together and attached to the third piston (No. 3088 H), which is manipulated by the third finger.

The tuning slide (No. 3072) is made up from a small crook (No. 3073), a brace or stay (No. 3085), with inside and outside tubing to conform to the leader pipe (No. 3074), and to the bore of the valves. (See assemble No. J, K, and L.)

A delicate part of cornet construction is the making of the leader pipe and the B flat and A set pieces. The tuning and voicing of a cornet depend largely on these parts. The leader pipe large elbow (No. 3074) in rough state, and shown finished in assemble exhibit M, is a bent tapering tube made from sheet metal, as shown cut to size and bent (No. 3065 D).

The B flat set-piece is a short tapering tube (assemble exhibit M), and is cut out of sheet brass (No. 3065), soldered together and spun to shape over a steel arbor. A socket is put on one end, and ferrule and knobs on the other.

The A set-piece is constructed in the same way, only it is made longer, to lower the tone of the instrument.

The mouthpiece is made either from a casting (No. 3076) or from a solid brass rod either turned by hand or by special

tools. The size and shape of the cup, the bore or throat, and the taper of the shank are all of vital importance and afford unlimited combinations.

The water key (No. 3086) is made from a number of small parts soldered together; its only function, as shown in assemble exhibit O and P, is to release the collected saliva on being opened. It is watertight when closed.

The assembling of a cornet requires large experience, and the tune and tonal qualities of the instrument depend largely on the care and accuracy with which this work is done.

CATALOGUE OF EXHIBITS ILLUSTRATING THE CONSTRUCTION OF THE CORNET.

CASE 129.

- 3060. SHEET of brass cut for bell.
- 3061. BELL folded, ready to braze.
- 3062. BELL brazed, ready to spin.
- 3063. BELL brazed and spun, straight.
- 3064. BELL filled with lead and bent.
- 3065. TUBING.
 - a.* Crook, cut to size, flat and bent. *b.* Shanks, cut to size, flat and bent. *c.* B flat shank, cut to size and bent. *d.* Tuning slide, cut to size and bent.
- 3066. MOUTHPIECE casting.
- 3067. CYLINDER-CAP casting.
- 3068. CROOKS or Elbows, small.

- 3069. SLIDE for half tone.
- 3070. SLIDE for one tone.
- 3071. SLIDE for one and a half tone.
- 3072. TUNING-SLIDE.
- 3073. SMALL CROOK connecting Tuning-slide & valves.
- 3074. MOUTHPIECE.
- 3075. ELBOWS.
- 3076. MOUTHPIECE.
- 3077. SHANK.
- 3078. SHANK.
- 3079. VALVE CAPS.
- 3080. CYLINDER LININGS.
- 3081. CYLINDER CASE.
- 3082. VALVE SPRINGS.
- 3083. PISTONS.
- 3084. VALVE CAPS.
- 3085. BRACE.
- 3086. WATER KEY.
- 3087. VENT for Water Key.
- 3088. CORNET PARTS ready to assemble.

a. Bell. *b.* Pistons. *c.* Springs. *d.* Cylinders. *e.* Cylinder (
f. Pillars. *g.* Slide, one tone. *h.* Slide, one and a half
i. Slide, half tone. *j.* Crooks. *k.* Tuning Slide. *l.* B
m. Mouthpiece Shanks. *n.* Mouthpiece. *o.* Water Key. *p.* W
Key Vent.

- 3089. CORNET assembled, ready to polish.
- 3090. CORNET completed.

TOOLS EMPLOYED IN THE CONSTRUCTION OF THE CORNET.

- 3091. WOODEN Mallet.
- 3092. HAMMER.
- 3093. MANDREL for shaping Bell.
- 3094. FILES, set of two.
- 3095. BRAD-AWL.
- 3096. SHEARS.
- 3097. BLOWPIPE.
- 3098. PINCERS.
- 3099. HAND VISE.
- 3100. DRAW PLATE.
- 3101. A. LEAD. B. SOLDER.
- 3102. MANDREL, Iron.

C. THE ORGAN.

INTRODUCTION BY GEORGE S. HUTCHINGS.

The Pipe Organ is universally and justly termed the "King of Instruments;" in fact, it might be characterized as an assemblage of instruments, since each individual stop or set of pipes represents to a great extent such orchestral instruments as the Violin, Viola, Violoncello, Violone (or double bass), Clarinet, Oboe, Trumpet, Trombone, Bassoon, and Flutes of various pitches, as well as the Diapasons, which are essentially the foundation tones of an Organ, and are to be found only in this instrument.

Presumably the history of the organ is familiar to most people interested in the instrument, hence it is considered unnecessary to repeat it here, except to note the fact that there have been more improvements in the last fifteen or twenty years than in the preceding two centuries.

The first and one of the most important adjuncts to an organ is the wind-chest (3291, 3292, 3293 A), on which the pipes are placed, and from which the "live wind" from the bellows is distributed. It is usually a rectangular box, varying in length, width, and depth according to the number of stops or sets of pipes it is to accommodate. There are three distinctive forms of wind-chest (or soundboard, as the English term it). The oldest, and until a comparatively recent date the most popular, was the so-called English or slide-chest (3293 A). The next was the Swiss¹ or puppet valve, which in some respects is an improvement over the slide-chest, as each individual pipe has its own valve which is mechanically operated from the keyboard, or from a stack of pneumatic motors. The third is the modern individual valve-chest, and of this there are endless varieties, as almost every builder has his own distinctive type; but in all of them the valve is operated by

¹ No example shown in this series of models.

pneumatic power instead of the direct muscular effort of the organist.

The modern, or pneumatic, wind-chest is so-called from the fact that every individual pipe is caused to speak through the office of its own independent pneumatic motor, instead of a motor for each key, as in the Swiss chest. As stated above, there being such a variety of pneumatic wind-chests, it would be impracticable to attempt a verbal description of more than one type. We will, therefore, select the "diaphragm" or "pouch motor" (329I, 3292 B) as being the most popular; it is more sensitive, works more quickly, and requires a smaller percentage of power than the more cumbersome bellows motor. In the manufacture of these wind-chests the Swiss chest is followed in a measure, as these have longitudinal compartments or chambers and stop-bars (329I, 3292 C), which serve also as partitions between the chambers, one chamber and one stop-bar for each stop. Through the top board (329I, 3292 D) a vertical hole (E) is bored, beneath which is placed a disc valve (F), three-sixteenths of an inch larger than the hole. The disc is of cardboard, covered on the side next the stop-board with a thickness of soft felt and a thickness of soft leather to make it tight. A few inches below this valve in the stop-bar is bored a hole or windway, three-eighths of an inch in diameter and about one inch deep (GG). Over the windway (GG) is placed a small pneumatic (H), which is really the pneumatic motor to operate the valve, through the instrumentality of the pneumatic, the top of which is fastened to the centre of the disc valve by means of a thin piece of metal; from the lower edge of the stop-bar a small hole (G) about three-eighths of an inch in diameter is bored upward into the hole (GG) back of the pneumatic (H), and in a vertical line with the latter. This hole communicates with the intermediate box (I), in these models placed underneath the wind-chest (329I, 3292 A). The intermediate valve (J) consists of a double valve operated by a small leather pneumatic or pouch (B), by an impulse of compressed air, sent through lead or brass tubes (K), from a small primary wind-

chest (L) at the back or inner end of the keyboard. In this primary wind-chest (L) a double valve (M) operates the intermediate pneumatic motor (N), which in turn moves the two-way valve (J) leading from the compressed air chamber or intermediate box (I). This, in its normal position, is open, and allows the compressed air to flow into the channel (G), and thence up into the pneumatic (H). It will be seen, therefore, that the pneumatic (H), in this stage, would be inoperative, while if the key were depressed the primary (M) would operate the intermediate, or the two-way valve (J), closing off the flow of air from the intermediate air chamber (I), and at the same time opening the valve (J) to the outer air, venting the channel (G). The air pressure in the longitudinal chamber will then force the pneumatic (H) inward and the valve downward, allowing a current of air to flow upward into the pipe (N), and causing it to emit its proper tone.

It will be understood that the above description has reference to a *single* note only, of a stop; for a *full* stop it would be multiplied by sixty-one, and multiplied again by the number of stops on that particular organ. The channels, the primaries, and intermediate motors are sixty-one in number, one for each manual key, and there would be as many motors discharging into these channels (hence its increased size) as there are stops on the wind-chest, provided the stop or register knobs were all drawn at one time.

For an electro-pneumatic organ (3292), the above description will serve fully to the point of the intermediate two-way valve (J), where the valve operating this two-way valve (J) is simply a small disc valve (O) of iron, covered with thin, soft leather to make it sit tight. Over this disc is placed a small magnet (P); leading from this magnet is a wire (Q) running to the keyboard (R). On the back end of the key is a metal contact (S), and when the key is depressed this contact comes into communication with a wire charged with an electric current of very low voltage. This sends an impulse through the wire to the magnet, charging it and causing it to attract the armature or disc valve (O) to itself, thus uncovering a small

hole (T), through which the intermediate or two-way valve (J) is vented, and from this point the operation is the same as with the tubular pneumatic system (3291).

A unison coupler¹ couples one manual to another, each key to the corresponding key on the other manual. A Sub Octave coupler (if on its own manual) will couple the key that is depressed to its octave below, while a Super Octave coupler will couple the depressed key to the octave above; with a Sub and Super Octave coupler from one manual to another, any unison key that may be depressed will couple an octave below and an octave above on the other manual.

In tubular and electro pneumatic organs, couplers can be multiplied almost indefinitely, more especially in the latter type. For instance, in an ordinary-sized three-manual organ, of, say, twelve stops on the Great and fourteen on the Swell and eight on the Choir, there is a total of thirty-four stops on the three manuals. Now, if there be a Sub and a Super Octave coupler on the Great Organ, together with the usual unison couplers, and if a single stop on this manual is drawn and a full chord held with the left hand on the second octave and a full chord with the right hand on the fourth octave, there would be twenty-five pipes speaking at once. Next, if all the stops on the Great Organ be drawn, twelve times twenty-five, or three hundred, pipes would be speaking at once. If the organist should draw the Swell to Great Unison and the Choir to Great Unison, the Swell to Great Sub Octave, Swell to Great Super Octave, and the Choir to Great Sub and Super Octave couplers, and draw the Full Swell and Choir organs, there would be five hundred and fifty more pipes speaking at once. Assume that one of the stops in the Great is a Compound stop, a mixture of three ranks, and in addition that there is a Dolce Cornet of five ranks in the Swell: this would make one hundred and fifty more pipes speaking at once, or a total of one thousand pipes speaking simultaneously by simply depressing ten keys.

The modern combination action is almost as elastic as the

¹ None shown in this series of models.

key action, since almost any number of movements can be made by either pistons or pedals or both. A light touch like that upon a key is sufficient to produce any combination, even to that of *Sforzando*, whether it be by piston or pedal. The grand *Crescendo* and *Diminuendo* are operated by a balanced pedal, and a simple movement of the foot brings on consecutively, from softest to loudest, every stop in the organ, and a reverse movement takes them off in reverse order.

The pipes of an organ are made of either wood or metal, the latter predominating. The large, heavy metal pipes are made from commercial sheet zinc of various thicknesses, according to requirements. The trebles are made of a composition of tin and lead, the alloy varying from 80 to 96 per cent. This composition is made by the pipe-makers, and is cast into sheets of various thicknesses. The maker cuts out his blanks for the pipes to scale; that is, the widths of these blanks must be the circumferences which the pipes are to be, each and every pipe throughout the stop varying both in diameter and length as well as in thickness. These blanks are next formed up into cylinders over mandrels of suitable diameters, and the edges brought together and soldered. The upper lip is formed (by flattening one side of the cylinder), and the *body* is then ready for the *foot*. The feet are cut out in blanks somewhat the shape of an acute triangle with the apex cut off, so that, when they are formed over conical mandrels they form cones, the bases of which are in diameter exactly equal to those of the bodies of the pipes to which they are to be affixed. The small end or toe (3290 A) is rounded, so that the opening is nearly closed; one side of the top or large end is flattened, and a piece of metal, called *language* (3290 B), is fitted on, one edge of which must be straight and beveled; this edge is placed parallel with the flattened part of the foot (C) and a trifle away from it, forming an open slit called a *flue* (B—C); the body and foot are next soldered together; the mouth (between C—D) is formed by cutting away part of the flattened surface of the pipe body, and the pipe is ready for the voicer.

Wood pipes are made from well-seasoned, first-quality pine lumber, varying in thickness from two and a half inches to less than one-eighth inch. In form the wood pipe is usually rectangular, sometimes square; in some old organs, triangular, and occasionally cylindrical, pipes are found.

The low C of the thirty-two foot open pipe is the largest, and is sometimes as much as twenty-four by twenty-eight inches in sectional area, while the upper pipe of Céleste would be one-eighth by three-sixteenths of an inch in area. In structure the wood pipe is as nearly like the metal as it is possible to make it from this material. The long, rectangular tube has a block at the lower end, glued solidly to the inside surface of the pipe; in this block is hollowed out a chamber, into which a piece of wood with a hole in the centre, called a foot (3286 A), is inserted. This foot answers two purposes: one for the pipe to stand on; the other, a conveyance for the wind to the chamber. This chamber has a cap screwed over it; from this chamber is a slit or opening called a *flue* (3290 B, C), the same as in the metal pipe. In the face of the pipe is cut an opening, called the *mouth* (between B—C). The upper lip (C) is formed by cutting away the greater part of the thickness of the stock over the mouth, leaving the upper lip quite thin and wedge-shaped. The compressed air from the wind-chest is forced out of the slit or flue in a sheet nearly the width of the interior of the pipe, and in thickness the width of the slit, or, say, from one-thirty-second to one-fourth of an inch, according to the size of the pipe. The wind, emerging from the flue of the pipe, traverses across the mouth, and, impinging on the sharp edge of this upper lip (C), is deflected outward, having in its journey set the column of air in the pipe vibrating, producing the tone.

There are two types of wood pipes: the Open (3289), and the Stopped (3283). The latter are closed at the top by a plug (3283 A), or tampion, and are only one-half the length of the Open pipes for the same pitch. It must be understood that the length of a pipe is the governing factor of its pitch. The

Reed pipes are so-called from the fact that the tone is produced by the vibration of a "reed," or "tongue." The beating reed (3271) is the most common type, as the free reed is extremely sensitive to changes of temperature, and the tone produced is not as agreeable as that of the beating reed.

The pipes consist of the barrel (3276 A), the block, the boot (3271 A), the eschalot (B), the tongue (C), and the tuning spring (D). The barrels are of various shapes: the most common is that of the Trumpet family, which is made in the shape of an inverted truncated cone. The tone-producing parts depend from the bottom of the block, and consist of the following: the eschalot (B), a brass tube with a flattened face, made very true and smooth, in which is the opening for the air to pass through into the body of the pipe; the tongue or reed (C), lying on the face of the eschalot, and fastened by a wedge (E) driven into the block (F). The reed is curved toward its outer end, so as to be raised from the face of the eschalot (B). The block (F) is set into the boot or socket (A) which serves as a foot for the pipe to stand on, and also as a conveyance for the wind. Through this block runs a piece of spring wire (D). At the lower extremity it is bent in such a manner that the end will lie crosswise on the reed: this is for the purpose of tuning. By driving down the wire, the vibrating part of the tongue will be shortened and the tone raised; by pulling it up, the tone will be flattened by lengthening the tongue. The pipes are also either slit near the top, like the flue pipes (3290 E), or have sliding tuners (3281 A) or caps (3276 B) as a further aid to tuning and regulating.

Next comes the voicing of the pipes. The department should be under the supervision of one having a sensitive and acute ear, and who possesses a high degree of mechanical skill. He should also have natural musical ability, and should be able to analyze tone, and have judgment to carry a certain quality as well as a corresponding degree of strength throughout the entire stop. The art of voicing consists in endowing the pipe with tone; for it must be understood that the pipe

as it comes from the maker is incapable of producing tone, although there may be here and there a few pipes of a stop which will produce a disagreeable noise if tested by blowing into them. The first movement in the process is to nick the language (3290 B), which is done by a diamond-shaped sharp instrument, so that when forced into the flue it will make an indentation on the edge of the language and also on the inner side of the lower lip. These nicks resemble saw teeth, sometimes fine, and at other times coarse and some distance apart. The next process is to adjust the flue, making it either larger or smaller as required; the next is to cut the upper lip to a proportionate height, and then to ream out the hole at the toe to admit the proper quantity of wind. Next a slit is cut near the top of the pipe, and the metal formed into a roll (3290 G) for tuning. The pipe is now placed on the voicing machine, which is a miniature organ, the bellows of which is weighted to correspond with the weight of wind to be used in the organ for which the pipes are made. The voicer then tests the pipe, and the chances are that he will have to adjust the language either upward or downward; he may also have to adjust the upper lip, that the sheet of air may properly impinge upon it. After the tone has been made satisfactory, the voicer adjusts the tuning-roll to bring it nearly to its proper pitch, as it will be in the organ. (It is always left a little flat to allow of adjustment when placed in the organ.) This process will be repeated for every pipe throughout the stop.

When reference is made to the scale of the different kinds of pipes, the calibre is always referred to, never the length, as that is governed solely by the calibre of the lowest, or eight-foot, C pipe. For instance, in a large scale Open Diapason, the lower C would be from seven to eight inches in diameter, and about seven feet six inches in length, while a small or slim scale string tone would be one and one-half inches in diameter and eight feet and some inches long. These two represent the two extremes, there being stops of eight-foot pitch ranging in scale all the way between these two. The qualities of tone in an organ are divided into four groups: Organ or

Diapason tone, Flute tone, String tone, and Reed tone. All of these tones are subdivided into sixteen, eight, four, and two foot stops. The Organ tone is represented by the sixteen and eight foot Diapasons, the four-foot Octave, and the two-foot Super Octave; the Flute tone, by the sixteen-foot Bourdon, eight-foot Gedackt, eight-foot Stopped Diapason, Melodia, Clababella, and those stops especially designated as Flutes; the String tone, by the Violone, Contra Gamba, eight-foot Gamba, Salicional, Keraulophon, Viol d'Orchestre, Viola, etc.; the Reed tone, by the sixteen-foot Trombone, Contra Fagotto, Contra Bassoon, eight-foot Trumpet, Cornopean, Oboe, Clarinet, Vox Humana, etc. All pipes other than Reed pipes are, strictly speaking, "flue" pipes, but in practice the metal pipes only are so designated, while the wood pipes, which are as much flue pipes as the metal (since their tone is obtained through the flue), are called "wood" pipes.

We have followed the construction of the organ and its constituent parts to the point of putting the pipes into the organ, and beginning the tone regulating and tuning, of which the first process is to tone regulate the Octave stop, four-foot, then set the pitch, and then from this one pipe the temperament is set. In a single octave of the Octave stop, the stop is carefully tuned in fourths and fifths, and from the tempered stop all of the other stops are tuned. After the instrument is thoroughly tested throughout, it is then ready to be taken apart, boxed, and shipped to its destination, where it will be erected and tuned throughout again.

CATALOGUE
OF
EXHIBITS ILLUSTRATING THE CONSTRUCTION
OF THE ORGAN.

The Pipes.¹

CASE 130.

3270. ONE OCTAVE of pipes, showing gradation.
3271. LOW C of Pedal Trombone, boot in section to show the reed tongue.
A. Boot. B. Eschalot. C. Tongue. D. Tuning-spring. E. Wedge. F. Block.
3272. METAL PIPE. Smallest.
3273. WOODEN PIPE. Smallest.
3274. TRUMPET.
3275. OBOE.
3276. CLARINET.
A. Barrel. B. Sliding tuner.
3277. VOX HUMANA.
3278. FLUTE TRAVERSO.
3279. FLÛTE HARMONIQUE.
3280. STOPPED DIAPASON.
3281. QUINTADENA.
A. Cap-tuner.
3282. FLÛTE À CHEMINÉE.
3283. DOPPEL FLUTE. Stopped Pipe.
A. Stop or Bung for tuning.
3284. GAMBA.

¹ Presented by the Hutchings Votey Organ Company, Boston, Mass.

3285. SPITZ FLUTE.

3286. MELODIA.

A. Foot. B. Cap. B—C. Mouth.

3287. VIOL D'ORCHESTRA.

3288. SALICIONAL.

3289. GROSS FLUTE, Open Pipe.

3290. OPEN DIAPASON, Flue Pipe.

A. Toe. B. Language. C. Flattened part of foot. C—D. Mouth.
E. Slit.

CASE 131.

Models of Action.¹

3291. TUBULAR PNEUMATIC ACTION. Section through wind-chest, showing primary of tubular action. Windways in black.

A. Wind-chest. B. Diaphragm or Pouch Motor. C. Stop bars. D. Top bar. E. Hole admitting air to pipe. F. Disc valve. G-GG. Windway. H. Pneumatic. I. Intermediate box. J. Intermediate two-way valve. K. Tubing. L. Small or primary wind-chest. M. Double valve operating Pneumatic Motor. N. Pneumatic Motor. R. Keyboard. X. Exhaust.

3292. ELECTRO - PNEUMATIC ACTION. Section through wind-chest, showing primary and magnet box of electro-pneumatic action. Windways in black.

A. Wind-chest. B. Diaphragm or Pouch Motor. C. Stop bars. D. Top bar. E. Hole admitting air to pipe. F. Disc valve. G-GG. Windway. H. Pneumatic. I. Intermediate box. J. Intermediate two-way valve. O. Metal disc valve. P. Magnet. Q. Wire. R. Keyboard. S. Metal contact. T. Vent-hole. X. Exhaust. U. Electric battery.

3293. TRACKER ACTION. Section through slide wind-chest; windways in black.

A. Wind-chest. B. Roller board. C. Slide, showing position when the register is off, the hole in the slide out of coincidence with that in the top board and table; in this position the pipe would be silent. D. Slide (shown in section), the hole coinciding through the board, slides, and table; in this position the pipe would be speaking. E. Square bar, showing regulating screw.

¹ Presented by the Hutchings Votey Organ Company, Boston, Mass.

V. KEYBOARD INSTRUMENTS.

V.

KEYBOARD INSTRUMENTS.

INTRODUCTORY NOTE.

The various keyboards described in this section, aside from the series illustrating the development of the pianoforte, represent examples of both stringed and wind instruments. Of the former, the finest specimen is the harpsichord, with its elaborately carved base, supposed to have been the property of Pope Innocent X. Equally interesting are the claviorganum, once in the collection of Carl Engel, and several quaint organs of the 18th Century. In the Piano Development Series, interest centres in the Cristofori Piano, the earliest specimen in existence, while around it are grouped examples of later manufacture, covering a period from 1720 to c. 1850. The prototypes of the piano, the monochord, dulcimer, hurdy gurdy, and clavichord are grouped in Case 135, while the work of some of the early American manufacturers is shown in Cases 136, 137, 138.

CATALOGUE
OF
KEYBOARD INSTRUMENTS.

CLASS I. STRINGED INSTRUMENTS.¹

SECTION A. PLUCKED STRINGS.

CENTRAL CASE.

2929. HARPSICHORD. Compass, five octaves, F to $\text{L}\flat$, lowest F sharp missing. A long trapeze-shaped instrument of alder wood. The outer case profusely carved with figures representing Neptune in his chariot, surrounded by attendants. A platform, resting on ten claw feet, supports an elaborate group of allegorical figures, composed of nymphs and satyrs, two of the latter carrying the instrument upon their upstretched arms. At one end of this group two dolphins bear a shell in which is seated the figure of a child. The entire surface of the case and the figures supporting it are in gilt, while the base, representing the sea, from which the figures rise, is in Italian blue. The soundboard has a sunken rose. The keys, ivory naturals with black sharps. Italy. c. 1650. Maker unknown.

Length, 8 feet 9 inches. Width, 2 feet 9 inches.

This instrument has survived the crude workmanship of numerous repairers, in some instances hand-made nails of wrought iron having been employed. The figures, which are of wood, are after the style of Michael Angelo, and the beautiful modeling has, to some degree, suffered from repeated attempts at restoration. Originally these figures were enameled in flesh color, the water having been the same color as at present. The enamel was, at a later date (c. 1700), overlaid with water-gilding, some of which still remains. It was purchased in Rome (c. 1864) by the late Vicomte de Sartiges, while Ambassador près le Saint Siège.

From a reliable source it has been learned that this harpsichord figured in the reign of Pope Innocent X, Giovanni Battista Panfilì (Panfilì or Pam-

¹ For examples of Class I, Stringed Instruments, Without a Keyboard, see page 40 ff; also Hand-Book No. 13, Europe, page 19 ff.

phili), and it is probable that this instrument was among the gifts of almost incredible magnificence which are known to have been made by Innocent to Olympia Maidalchina, the widow of his brother, and by whom he is said to have been completely dominated. His reign extended from 1644 to 1656, and in its earlier years Donna Olympia conducted a court of great state and extravagance. In later years she became so niggardly that, when the Pope died, she refused to be taxed for his burial, saying that she was a poor widow.

The two figures Nos. 2929 A and 2929 B, which accompany the harpsichord, seem to form no part of it, although they appear to be of the same general workmanship and design, the former being the figure of a man playing upon a bagpipe, the latter that of a woman in such position as to suggest that she originally held a lute, which, however, is now missing.

I. SERIES SHOWING THE DEVELOPMENT OF THE PIANO.

SECTION B. STRUCK STRINGS.

INTRODUCTION BY F. W. GALPIN.

The piano in its embryonic form may be traced to the monochord, a simple pitch-measuring apparatus used in the early centuries for determining intervals; and this instrument with its single string developed, as did all other stringed instruments of the plucked or struck type, from the musical bow of primitive man. Gradually the single string was supplemented by others, and the dulcimer, with its numerous strings stretched over a horizontal sound-box and struck with small hammers, was the result. With the organistrum, the early form of the hurdy gurdy, the principle of the key was applied to this class of instrument. In the clavichord we have a more developed form of keyboard stringed instrument, the earliest of those commonly recognized as such, and the prototype of the modern piano. In this the string is struck with a small metal tangent placed at the end of the key, a principle involved in the action of all modern pianofortes.

Amid the many claims to the invention of the pianoforte, it is satisfactory to know that the honor has at length been awarded without doubt to Bartolomeo Cristofori, of Padua. A detailed account, with illustrations, of his new instrument "with piano and forte" was issued at Venice in 1711, and it is particularly mentioned that, unlike the Harpsichord, the gradation of its tone depended upon the light or strong touch of the player. The present series of examples, showing the chief steps in the development of the piano, is therefore most fitly

commenced with an instrument (No. 1219, page 134) which is the original work of Cristofori himself. Only two specimens are known to exist, and this, dated 1720, made at Florence, is the earlier. It will be noticed that the shape is that of the Harpsichord, continued to the present day in the horizontal Grand Piano. As a Harpsichord maker, Cristofori may have been particularly attached to this form, and, although the rectangular Clavichord had been for centuries in use, he seems to have evolved his new instrument directly from the Dulcimer (No. 1573, page 133), with its little hammers held between the fingers. The great point in his "action" (the mechanical device for striking the string) is the "escapement," which allows the hammer to fall back immediately after the blow, thereby enabling the string to sound freely. This was impossible on the Clavichord, as immediately the hammer (or tangent) left the string the tone was lost. He also invented the "check," an upright rest placed at the end of the key to receive the rebound of the hammer. The "dampers," for silencing the strings when the finger is lifted from the key, bear a distinct resemblance to the Harpsichord action.

Shortly after Cristofori's invention, Marius in France and Schroeter in Germany produced keyboard instruments on the hammer system. Into the latter country, Gottfried Silbermann,¹ of Dresden, introduced the system adopted by Cristofori, and his pupil, Charles Friederici,² of Gera, in Saxony (1712-1779), is said to have been the first to make the piano-forte in the rectangular or square shape. Details of his invention are at present unknown, but the primitive mechanism of the Nuremberg Piano (No. 1197, page 136) probably represents one of the earliest applications of the hammer in this form. There is no "escapement:" the hammer is thrown on to the string with a sharp jerk, caused by the butt hitting against a block of wood fixed at the back of the instrument. After the jerk the hammer falls away from the string, as the end of the key, working in a slot rail, is prevented from rising

¹ Portrait No. 439, Central Case.

² Portrait No. 428, Central Case.

higher. This form of action is found with various improvements in the pianos made in South Germany and Austria during the latter half of the 18th Century and even to the present day. It is generally known as the "Viennese Action," having been adopted by the great maker, Andreas Stein,¹ of Augsburg, whose son transferred the business to Vienna in 1792. An instrument of his workmanship (No. 1213, page 137) shows traces of the shifting foot pedal invented in 1789, whereby the keyboard is moved so that the hammers strike but one or two of the three unison strings, thereby diminishing or increasing the volume of sound. These pianos were much admired by Mozart and Beethoven for the lightness of their touch.

Another form of the Square Piano was introduced into England in 1760 by Zumpe, and its mechanism was known as the English action. One of the earliest surviving examples of Zumpe's work is seen in specimen No. 2965, page 137). The action is extremely simple: toward the end of the key is fixed an upright wire with a leather head or stud on the top; this hits the hammer which rests immediately above on a small rail. The dampers are raised by pieces of whalebone which are placed at the end of the keys, while at the side of the case there are three stops or levers—two ("loud") for raising all the dampers off the strings in sections treble and bass, and one ("soft") bringing a shifting bar of felted wood into contact with the strings. This action was used by John Broadwood, of London, for his square pianos, one of which is shown in No. 2805, page 137, with several interesting improvements, including the foot pedal for raising the dampers and an arrangement of the tuning-pins at the back of the instrument. This action was adopted by the early American makers, of whose handiwork the square piano (No. 1199, page 139) by Albrecht, of Philadelphia, is a good specimen.

The greatest improvement in the Square Piano action was, however, made by John Geib, who, in 1786, invented the "underhammer," an additional lever placed beneath the "hopper"

¹ Portrait No. 427, Central Case.

(or upright which raises the hammer), thereby much increasing the rapidity of the blow. It is popularly known as the "grasshopper" action, and has come into general use in England and America. An example is seen in the instrument No. 1208, page 137, by Clementi & Co., the successors of the original holders of the patent. In France, rapidity of action, or, as it is now called, "repetition," occupied the attention of the important firm of Erard, and the specimen No. 2147, page 138, shows the progress made in this feature, which was not perfected, however, until Pierre Erard, in 1821, produced the "double escapement." Erard also originated the "second bridge," which gives greater freedom to the vibration of the strings.

A word must be said about the Upright Piano. Suggested by Marius in his patents of 1716, the vertical form was early in use; an upright grand piano seen at Pistoia bore the label, "Domenico del Mela 1739," but these instruments were merely adaptations of the horizontal piano action, following the idea of the upright Harpsichord or Clavicytherium; and although many small alterations were made which were claimed as inventions, such as that of William Stodart (No. 2804, page 138), who in 1795 brought before the public his "newly invented upright grand pianoforte of the form of a bookcase," yet it remained for John Hawkins, in 1800, to invent an upright piano with a special action of its own. This, as will be seen in the instrument by John Broadwood (No. 2768, page 138), carried the strings down to the bottom of the case, and was provided with long rods, or "stickers," from the end of the keys to strike the butts of the hammers.

During the last century the progress made in the elaboration of the pianoforte has been marvellous and minute: the models of modern mechanism kindly provided by distinguished makers will show this; but the principles from which the intricate actions of to-day have been evolved are clearly set out in the interesting series of examples here displayed. A few of the leading improvements may be mentioned: The wooden frame was strengthened by Hawkins (1800); James Broad-

wood's tension-bars (1827); a complete iron frame by Babcock (1830), or, according to some, by Meyer, of Philadelphia (1832), perfected by Chickering (1840); cross or over stringing was patented by Babcock, of Boston (1830); the "Cabinet" piano introduced by Southwell (1807), and the "Cottage" piano by Wornum (1811), together with the results of the inventive genius of Theodore Steinway (1825-1889) embodied in the magnificent and sonorous instruments of the well-known firm, in which the highest point of lightness and velocity, of brilliancy of tone and rapidity of action, seems to have been reached.

The following treatises may be consulted¹ for further and fuller information: WELCKER, "Der Flügel" (Frankfurt am Main, 1856); RIMBAULT, "History of the Pianoforte" (London, 1860); PONSSICCHI, "Il Pianoforte, sua Origine e Sviluppo" (Florence, 1876); SPILLANE, "History of the American Pianoforte" (New York, 1890); STEINERT, "Treatise on Keyed Instruments, etc." (New York, 1893); HIPKINS, "History of the Pianoforte" (London, 1896); with articles in Musical Dictionaries (Grove, etc.) and Encyclopædias.

¹In the Library of the Museum.

CATALOGUE

CASE 135.¹

1386. MONOCHORD. Body a rectangular box, the sound-board having an ornamental rose. One metal string, attached to the bottom, passes over 2 brass bridges, and is tuned by an iron pin placed in the farther end. Beneath the strings a narrow finger-board, containing 16 wire frets. Italy. 19th Century.

Length, 1 foot 4 inches. Width, $2\frac{3}{4}$ inches.

1573. DULCIMER. Trapeze-shaped, shallow sound-box, pierced with two geometrical roses, and furnished with nine sets of quadruple steel strings, which formerly passed over movable bridges placed on the soundboard, and are tuned by 36 metal pins placed in the sloping side of the instrument. Switzerland. 19th Century.

Length of longest side, 1 foot 9 inches. Width, 9 inches.

The Dulcimer differs from the Psaltery principally in being struck by hammers instead of being plucked by the fingers. Thus it becomes the parent of the Clavichord and Piano, as the Psaltery is the predecessor of the Spinnet, Virginal and Harpsichord.

In Germany the Dulcimer is called the *Hackbret*; in Italy it is known as *Salterio Tedesco*; in France as the *Tympanum*.

2817. VIELLE. Hurdy Gurdy. Guitar-shaped body, front edged with ebony and ivory inlay. At the lower part of the sound-board, 2 ornamental crescent-shaped sound-holes. Carved bridge and inlaid tail-piece. Two strings, one for the melody, pass over the keys and are sounded by the wheel, which is turned by a handle. On either side 2 drone strings. The head is curved, and terminates in the representation of a human figure. Six pegs inserted from the front. Two rows of tangents, attached to wooden keys moved by the fingers, give the chromatic scale. The tangent mechanism is enclosed within a box having an inlaid cover. Europe, 18th Century.

Length, 1 foot 11 inches. Width, 11 inches.

3137. CLAVICHORD. Compass, four octaves and a third, C to E. An oblong wooden case, painted gray; the cover removed.

¹ For description of Nos. 3112, 3110, 3114, 3113, 3116, 3115, 1926, see pages 100, 101.

Keys, light wood naturals, black sharps. Keyboard recessed. This instrument is *gebunden* or *fretted*. Two strings to each note. The lower 10 notes *bundfrei* or *unfretted*. Germany. 17th Century. Maker unknown.

Length, 3 feet 8 inches. Width, 1 foot $1\frac{1}{2}$ inches.

CENTRAL CASE.

1219. PIANO. Compass, 4 octaves and a fourth—C to F.

Trapeze-shaped case of cedar, standing on 3 legs. Outside of case painted black. Keys, light wood naturals, with black sharps. 2 ivory knobs on the side blocks, enabling the action to be withdrawn from the instrument. Two strings to each note. The vibrating length of the longest string is 6 feet 2 inches; the shortest $4\frac{1}{2}$ inches. Soundboard without a rose. Italy. 1720. Maker, Bartholomæus de Christophoris. Above the front-board on the block which carries the action, are the following inscriptions: "Bartholomæus de Christophoris Patavinus Inventor Facierat Florentiæ, MDCCXX," impressed in Roman characters, and on one side, in running hand, "Restaurato l'Anno, 1875, da Cesare Ponsicchi Firenze."

Length, 7 feet $7\frac{1}{2}$ inches. Width, 3 feet 3 inches. Depth, $9\frac{1}{2}$ inches.

This specimen possesses an unusual interest, as being the earlier of the two existing pianos known to have been made by Cristofori, the inventor of the pianoforte. The other, dated 1726, is in the possession of Mons. Alexandre Kraus, of Florence, Italy.

Bartolomeo di Francesco Cristofori was born in Padua in 1653, and died in 1731. The house where he lived is not known. His workshop was in the *Officina* (offices) of the Count of Tuscany, where he was under the auspices of the Prince of Tuscany. A monument erected after the Cristofori *Festa* is in the Cloister of Santa Croce, on the right of the entrance coming from the piazza, and at the end of the Loggia. No portrait of Cristofori is known to exist.

From Mr. Hipkins' introductory article on Keyboard Instruments (page xxxi) we quote the following: "Cristofori's invention was published in 1711, and this pianoforte, dated 1720, represents it in its perfected form. The action has the 'escapement,' without which there can be no vibrating note; the 'check,' an all-important step toward repeating notes; the shake, etc. Cristofori's action was exactly copied by Silbermann, as well as the structure of the instrument, in the three pianos he supplied to Frederick the Great, which are still preserved at Potsdam. The biographical notice of Cristofori in Grove's 'Dictionary of Music and Musicians,' gives all the known antecedent particulars of this historical Piano e Forte and its inventor and maker."

The following documents have interest as bearing on the authenticity of the specimen. The first is a statement by Signor Diego Martelli, the last owner, from whom the instrument was purchased; the second is a permit granted his mother by the National Museum of Florence to visit her piano during the time when it was temporarily on exhibition; the third is an affidavit

of Giorgio Ceccherini, an expert in musical instruments, by whom the piano was examined prior to its transfer.

I

Statement of Signor Diego Martelli concerning the Cristofori Piano:

"Florence, Italy, Nov. 23d, 1895.

"This piano was bought by my maternal grandfather, Dr. Fabio Mocenni, years ago, when my mother was about five years old. My mother was born in 1814, and her father must have acquired the piano between 1819 and 1820. It remained always in my grandfather's house until his daughter married my father (the Engineer, Charles Martelli). Then she brought that piano into my family and always preserved it, not because of its great value, as she knew nothing of it until very lately, but in memory of her dead father, and because on that piano, when still a child, she learned the first rudiments of music. My mother, by family tradition, knew that this piano had been purchased by her father at a public sale which took place in the Grand Ducal Palace, in Siena, by order of the Minister of the Household, of all such things as he considered as worthless and of no use. The discovery that this piano was very valuable was as follows:

"For the sake of economy during the time that Florence was the Capital of Italy, we rented the first floor of our house, No. 3 Via del Melarancio, and occupied the second floor. In 1872, Signora Martelli (my mother) again changed her apartments from the second to the first floor, and at the moment the transfer of our furniture was taking place from one floor to the other, Prof. Cosimo Conti, a scholar and an intimate friend of ours, came to visit us. The professor was in close correspondence with Cavaliere L. Puliti, who was spending a great deal of his time in trying to discover the origin of the piano, and discovered on it, to his great surprise, an inscription which attested that it had been made by Bartolomeo de Cristoforis. He immediately informed his friend, Cavaliere L. Puliti, of this fact, and he came at once to examine it. Then it was ascertained that it was one of the rarest and most valuable pianos in existence. We at once sent for a tuner and had it put in good condition, and the most distinguished pianists of Italy have since played on it.

"Cavaliere L. Puliti published a book on the life of Ferdinando de Medici, Grand Duke of Tuscany, and in it he treated of the origin of the piano. In this learned book, at page 31, he mentions the piano in possession of my mother (Signora Martelli), which is now your property.

"In 1876 Signor Cesare Ponsicchi published a work entitled 'The Piano, Its Origin and Evolution.' In his monograph, Signor Ponsicchi, at pages 26 and 27, speaks at length of this piano and illustrates it at the end of the volume.

"I believe that the above information will satisfy your legitimate curiosity, and by indicating to you the above published works to which you may refer for more detailed information, I have complied with your wishes in the matter.

I remain, very truly,

(Signed)

"DIEGO MARTELLI,

"Only son and heir of Ernesta Mocenni, Widow Martelli."

The two books referred to in the above account: "The Life of Ferdinando de Medici, Grand Duke of Tuscany," by Cavaliere L. Puliti, and "The Piano, Its Origin and Evolution," by Cesare Ponsicchi, are now out of print, and it is impossible to obtain them. Through the courtesy of Signor Martelli, the Museum was enabled to purchase his own copies, and these, together with the cofra, in which he kept them, are now in the library.

II

Translation of permit to visit the National Museum of Florence at any time, granted to Signora Martelli, who loaned her Cristofori Pianoforte to the Museum:

"National Museum of Florence,

Florence, Sept. 9th, 1883.

"The noble lady Ernesta Martelli, being the owner of the old Pianoforte De Cristofori, loaned by her to the National Museum of Florence, is granted permission to enter the museum at any time she may wish to see the condition of her Pianoforte.

(Signed)

"The Director,

"C. DONATI."

III

Copy of affidavit of Giorgio Ceccherini regarding his examination, etc., of the Cristofori Pianoforte:

"Kingdom of Italy, }
City of Florence } ss.

"I, Giorgio Ceccherini, of the firm of G. & C. Ceccherini, dealers in pianos and musical instruments, successors to Messrs. Dussi, established in the year eighteen hundred and thirty-four, in the City of Florence, Kingdom of Italy, examined, in the months of May and June, eighteen hundred and ninety-five, at various times, an ancient piano, the original production of the late 'Cristofori,' the best manufacturer of pianos in the early part of the eighteenth century, said Cristofori having been the inventor of pianos.

"I do solemnly, sincerely and truly declare that I am an expert in the line of musical instruments, and that the aforementioned piano commands a price of a rare piece of antiquity, and as such was sold to Mrs. John Crosby Brown, of New York, United States of America. I do finally, solemnly, sincerely and truly declare to the best of my knowledge and recollection, that the piano aforesaid was bought for presentation to a Museum in New York.

"Florence, January 17th, A. D. 1896.

(Signed)

"GIORGIO CECCHERINI. [L.s.] "

"[L.s.] Subscribed and sworn to this 17th day of January, 1896, before me,

(Signed)

"C. BELMONT DAVIS,

"United States Consul at Florence, Italy."

1197. PIANO. Compass, 5 octaves—F to F. Oblong case, supported upon a stand, with 2 legs resting on cross-bars. The outside of the case decorated with appliqué open-work in black oak. Keys, ebony naturals, with ivory sharps. Primitive German action, without escapement. Originally furnished with one forte pedal, lifting the dampers. Nuremberg, Germany. 18th Century. Maker unknown.

Length, 5 feet 4 inches. Width, 1 foot 10¾ inches. Depth, 8 inches.

1927. MODEL OF ACTION Nuremberg Piano (No. 1197).
Primitive Viennese method, without escapement.
3107. MODEL OF ACTION. Cristofori Piano (No. 1219).

No. 1213.

1213. PIANO. Compass, 6 octaves—F to F₁. Oblong mahogany case with rounded corners, resting on two supports with spread feet, brass mounted. The case decorated with inlaid lines. Keys, ivory naturals, with black sharps. Two pedals working in an ornamental lyre below the instrument, respectively, raise the dampers or mute the strings with soft leather. Wrest-pins in front of instrument. Bi-cord, the last 8 notes single. Austria. Early 19th Century. Maker, André Stein d'Augsbourg à Vienne.
- Length, 5 feet 6 inches. Width, 2 feet 7½ inches. Depth, 1 foot 2 inches.

This is apparently the work of Matthäus Andreas Stein, who removed from Augsburg to Vienna on the death of his father, Johannes Andreas Stein, in 1792. The Stein pianos were used by Mozart and Beethoven.

2965. PIANO. Compass, 5 octaves, less one note, G to F. Oblong mahogany case resting on a stand with four square legs. Keys, ivory naturals, with black sharps. Two stops inside of the case on the left hand side regulate the dampers, one raising the upper half, the other the lower. The instrument is inscribed as follows: "Johannes Zumpe, Londini, Fecit 1767, Princess Street, Hanover Square," and has XVIII stamped on the back of the nameboard. England. 18th Century.
- Length, 4 feet 2 inches. Width, 1 foot 6½ inches.

2805. PIANO. Compass, 5 octaves and a fifth, F to C. Oblong mahogany case, with turned legs ornamented with gilt capitals. Keys, ivory naturals, with black sharps. Bi-cord; the last six notes overspun. One forte pedal. The name-plate bears the following inscription: "John Broadwood & Sons, Makers to His Majesty and Princesses, Gt. Poultney Street, Golden Square, London, 1807."
- Length, 5 feet 4½ inches. Height, 2 feet 9 inches. Width, 1 foot 11 inches.

1208. PIANO. Compass, 6 octaves—F to F. Oblong mahogany case, in Sheraton style, with inlaid lines and brass mountings, on 6 turned legs. Keys, ivory naturals, with black sharps.

One forte pedal raising the damper. John Geibs hopper action, invented in 1786. England. c. 1800. Makers, Clementi & Co., London.

Length, 5 feet 7½ inches. Width, 2 feet. Depth, 9 inches.

2147. PIANO. 5 octaves—F to F. Oblong mahogany case, ornamented with raised brass lines and resting on 4 turned legs. Keys, ivory naturals, with black sharps. Bi-cord throughout. This instrument originally had 2 knee or pedal levers, the invention of Erard, in 1794, which, respectively, raised the dampers and muted the strings by lifting a beam covered with soft leather. France. 1800. Makers, Erard Frères et Cie, Rue du Mail, No. 37a, Paris.

Length, 4 feet 10½ inches. Width, 2 feet. Depth, 8 inches.

2804. PIANO. Compass, 5 octaves and a fifth, F to C. Upright model. Mahogany case supported on four square tapering legs, inlaid with white wood and ornamented with brass mounts. The upper part in cabinet form enclosing the works, the unoccupied space being utilized with shelving. Two glass doors lined with antique white velvet, decorated with painting of musical instruments, much discolored. Keys, ivory naturals, with black sharps. Early English action. Tri-cord throughout. Divided bridge. Two pedals. England, 1801. Maker, W. W. Stodart, Golden Square.

Height, 8 feet 8 inches. Width, 3 feet 7½ inches. Depth, 1 foot 10 inches.

2768. PIANO. Compass, 6 octaves, F to F. Upright model, the upper part square, a column on either side terminating in a foliated capital. The lower part in cabinet form, the keyboard supported by two carved legs and covered by a rounded lid. The case, polished mahogany; the front, above the keyboard, of crimson brocade. Keys, ivory naturals, with black sharps. The usual Broadwood action, leather hammers covered with white felt and hinged with a bit of parchment. The most interesting point is the length of the abstract from the end of the key to the action proper, which is 2 feet and 6 inches. The abstract is attached to the hammer-butt with buckskin, and the damper is also attached to the abstract in this case with wire. Single cord throughout. Length of longest bass string, 5 feet 6 inches; vibrating length of same, 5 feet. Eleven covered bass strings. England. 18th Century. Makers, John Broadwood & Sons.

Height, 6 feet 2½ inches. Width, 3 feet 9 inches.

3347. PIANO LYRE. Compass, 6 octaves, F to F. Upright model, the upper part lyre shape, the lower part in the form of a cabinet. The case mahogany with gilt mounts and a silk front. A medallion in carved wood at the base of the lyre represents the head of Handel (?). Keys, ivory naturals, with black sharps. The loud pedals are placed beneath the keyboard in the centre. The first 21 notes of the bass have two strings to the unison, the remaining notes three strings to the unison. Old German action, with the keys bent at right angles, the hammers striking the strings below the key line. In addition to the usual keyboard, there is a pedal attachment comprising 27 notes, which operates on a second set of strings for which there is also a separate soundboard. The pedal keyboard is placed within the cabinet. Germany. Early 19th Century. The name plate bears the inscription: "Erfunden und verfertigt von J. L. Schliep. Berlin."

Height, 6 feet $10\frac{1}{2}$ inches. Width, 3 feet $7\frac{1}{4}$ inches. Depth, 2 feet $\frac{1}{2}$ inch.

II. PIANOFORTES BY EARLY AMERICAN MAKERS.

CENTRAL CASE.

1199. PIANO. 5 octaves—F to F. Oblong case of mahogany, inlaid with white wood and ornamental lines, resting on a stand with 4 legs, brass mounted. Keys, ivory naturals, with black sharps. A forte lever on the left-hand side of the case raises the dampers. Bi-cord. U. S. A. Late 18th Century. Maker, Chas. Albrecht, Philadelphia. Drexel Collection.

Length, 5 feet $2\frac{3}{4}$ inches. Width, 2 feet 9 inches. Depth, 9 inches.

CASES 136, 137, 138.

2858. PIANO. Compass, 5 octaves and a fifth, F to C. Oblong mahogany case, with inlaid lines. Keys, ivory naturals with black sharps. Bi-cord throughout, the eight lower bass notes overspun. Originally furnished with a forte pedal raising the dampers. U. S. A. c. 1800. Maker, Benjamin Crehore, Boston.

Length, 5 feet $6\frac{1}{2}$ inches. Width, 1 foot $11\frac{1}{4}$ inches. Height, 2 feet $9\frac{1}{2}$ inches.

One forte pedal raising the damper. John Geib's hopper action, invented in 1786. England. c. 1800. Makers, Clementi & Co., London.

Length, 5 feet 7½ inches. Width, 2 feet. Depth, 9 inches.

2147. PIANO. 5 octaves—F to F. Oblong mahogany case, ornamented with raised brass lines and resting on 4 turned legs. Keys, ivory naturals, with black sharps. Bi-cord throughout. This instrument originally had 2 knee or pedal levers, the invention of Erard, in 1794, which, respectively, raised the dampers and muted the strings by lifting a beam covered with soft leather. France. 1800. Makers, Erard Frères et Cie, Rue du Mail, No. 37a, Paris.

Length, 4 feet 10½ inches. Width, 2 feet. Depth, 8 inches.

2804. PIANO. Compass, 5 octaves and a fifth, F to C. Upright model. Mahogany case supported on four square tapering legs, inlaid with white wood and ornamented with brass mounts. The upper part in cabinet form enclosing the works, the unoccupied space being utilized with shelving. Two glass doors lined with antique white velvet, decorated with painting of musical instruments, much discolored. Keys, ivory naturals, with black sharps. Early English action. Tri-cord throughout. Divided bridge. Two pedals. England, 1801. Maker, W. W. Stodart, Golden Square.

Height, 8 feet 8 inches. Width, 3 feet 7½ inches. Depth, 1 foot 10 inches.

2768. PIANO. Compass, 6 octaves, F to F. Upright model, the upper part square, a column on either side terminating in a foliated capital. The lower part in cabinet form, the keyboard supported by two carved legs and covered by a rounded lid. The case, polished mahogany; the front, above the keyboard, of crimson brocade. Keys, ivory naturals, with black sharps. The usual Broadwood action, leather hammers covered with white felt and hinged with a bit of parchment. The most interesting point is the length of the abstract from the end of the key to the action proper, which is 2 feet and 6 inches. The abstract is attached to the hammer-butt with buckskin, and the damper is also attached to the abstract in this case with wire. Single cord throughout. Length of longest bass string, 5 feet 6 inches; vibrating length of same, 5 feet. Eleven covered bass strings. England. 18th Century. Makers, John Broadwood & Sons.

Height, 6 feet 2½ inches. Width, 3 feet 9 inches.

- 3347. PIANO LYRE.** Compass, 6 octaves, F to F. Upright model, the upper part lyre shape, the lower part in the form of a cabinet. The case mahogany with gilt mounts and a silk front. A medallion in carved wood at the base of the lyre represents the head of Handel (?). Keys, ivory naturals, with black sharps. The loud pedals are placed beneath the keyboard in the centre. The first 21 notes of the bass have two strings to the unison, the remaining notes three strings to the unison. Old German action, with the keys bent at right angles, the hammers striking the strings below the key line. In addition to the usual keyboard, there is a pedal attachment comprising 27 notes, which operates on a second set of strings for which there is also a separate soundboard. The pedal keyboard is placed within the cabinet. Germany. Early 19th Century. The name plate bears the inscription: "Erfunden und verfertigt von J. L. Schliep. Berlin."

Height, 6 feet $10\frac{1}{2}$ inches. Width, 3 feet $7\frac{1}{4}$ inches. Depth, 2 feet $\frac{1}{2}$ inch.

II. PIANOFORTES BY EARLY AMERICAN MAKERS.

CENTRAL CASE.

- 1199. PIANO.** 5 octaves—F to F. Oblong case of mahogany, inlaid with white wood and ornamental lines, resting on a stand with 4 legs, brass mounted. Keys, ivory naturals, with black sharps. A forte lever on the left-hand side of the case raises the dampers. Bi-cord. U. S. A. Late 18th Century. Maker, Chas. Albrecht, Philadelphia. Drexel Collection.

Length, 5 feet $2\frac{3}{4}$ inches. Width, 2 feet 9 inches. Depth, 9 inches.

CASES 136, 137, 138.

- 2858. PIANO.** Compass, 5 octaves and a fifth, F to C. Oblong mahogany case, with inlaid lines. Keys, ivory naturals with black sharps. Bi-cord throughout, the eight lower bass notes overspun. Originally furnished with a forte pedal raising the dampers. U. S. A. c. 1800. Maker, Benjamin Crehore, Boston.

Length, 5 feet $6\frac{1}{2}$ inches. Width, 1 foot $11\frac{1}{4}$ inches. Height, 2 feet $9\frac{1}{2}$ inches.

One forte pedal raising the damper. John Geibs hopper action, invented in 1786. England. c. 1800. Makers, Clementi & Co., London.

Length, 5 feet 7½ inches. Width, 2 feet. Depth, 9 inches.

2147. PIANO. 5 octaves—F to F. Oblong mahogany case, ornamented with raised brass lines and resting on 4 turned legs. Keys, ivory naturals, with black sharps. Bi-cord throughout. This instrument originally had 2 knee or pedal levers, the invention of Erard, in 1794, which, respectively, raised the dampers and muted the strings by lifting a beam covered with soft leather. France. 1800. Makers, Erard Frères et Cie, Rue du Mail, No. 37a, Paris.

Length, 4 feet 10½ inches. Width, 2 feet. Depth, 8 inches.

2804. PIANO. Compass, 5 octaves and a fifth, F to C. Upright model. Mahogany case supported on four square tapering legs, inlaid with white wood and ornamented with brass mounts. The upper part in cabinet form enclosing the works, the unoccupied space being utilized with shelving. Two glass doors lined with antique white velvet, decorated with painting of musical instruments, much discolored. Keys, ivory naturals, with black sharps. Early English action. Tri-cord throughout. Divided bridge. Two pedals. England, 1801. Maker, W. W. Stodart, Golden Square.

Height, 8 feet 8 inches. Width, 3 feet 7½ inches. Depth, 1 foot 10 inches.

2768. PIANO. Compass, 6 octaves, F to F. Upright model, the upper part square, a column on either side terminating in a foliated capital. The lower part in cabinet form, the keyboard supported by two carved legs and covered by a rounded lid. The case, polished mahogany; the front, above the keyboard, of crimson brocade. Keys, ivory naturals, with black sharps. The usual Broadwood action, leather hammers covered with white felt and hinged with a bit of parchment. The most interesting point is the length of the abstract from the end of the key to the action proper, which is 2 feet and 6 inches. The abstract is attached to the hammer-butt with buckskin, and the damper is also attached to the abstract in this case with wire. Single cord throughout. Length of longest bass string, 5 feet 6 inches; vibrating length of same, 5 feet. Eleven covered bass strings. England. 18th Century. Makers, John Broadwood & Sons.

Height, 6 feet 2½ inches. Width, 3 feet 9 inches.

3347. PIANO LYRE. Compass, 6 octaves, F to F. Upright model, the upper part lyre shape, the lower part in the form of a cabinet. The case mahogany with gilt mounts and a silk front. A medallion in carved wood at the base of the lyre represents the head of Handel (?). Keys, ivory naturals, with black sharps. The loud pedals are placed beneath the keyboard in the centre. The first 21 notes of the bass have two strings to the unison, the remaining notes three strings to the unison. Old German action, with the keys bent at right angles, the hammers striking the strings below the key line. In addition to the usual keyboard, there is a pedal attachment comprising 27 notes, which operates on a second set of strings for which there is also a separate soundboard. The pedal keyboard is placed within the cabinet. Germany. Early 19th Century. The name plate bears the inscription: "Erfunden und verfertigt von J. L. Schliep. Berlin."

Height, 6 feet 10½ inches. Width, 3 feet 7¼ inches. Depth, 2 feet ½ inch.

II. PIANOFORTES BY EARLY AMERICAN MAKERS.

CENTRAL CASE.

1199. PIANO. 5 octaves—F to F. Oblong case of mahogany, inlaid with white wood and ornamental lines, resting on a stand with 4 legs, brass mounted. Keys, ivory naturals, with black sharps. A forte lever on the left-hand side of the case raises the dampers. Bi-cord. U. S. A. Late 18th Century. Maker, Chas. Albrecht, Philadelphia. Drexel Collection.

Length, 5 feet 2¾ inches. Width, 2 feet 9 inches. Depth, 9 inches.

CASES 136, 137, 138.

2858. PIANO. Compass, 5 octaves and a fifth, F to C. Oblong mahogany case, with inlaid lines. Keys, ivory naturals with black sharps. Bi-cord throughout, the eight lower bass notes overspun. Originally furnished with a forte pedal raising the dampers. U. S. A. c. 1800. Maker, Benjamin Crehore, Boston.

Length, 5 feet 6½ inches. Width, 1 foot 11¼ inches. Height, 2 feet 9½ inches.

One forte pedal raising the damper. John Geibs hopper action, invented in 1786. England. c. 1800. Makers, Clementi & Co., London.

Length, 5 feet 7½ inches. Width, 2 feet. Depth, 9 inches.

2147. PIANO. 5 octaves—F to F. Oblong mahogany case, ornamented with raised brass lines and resting on 4 turned legs. Keys, ivory naturals, with black sharps. Bi-cord throughout. This instrument originally had 2 knee or pedal levers, the invention of Erard, in 1794, which, respectively, raised the dampers and muted the strings by lifting a beam covered with soft leather. France. 1800. Makers, Erard Frères et Cie, Rue du Mail, No. 37a, Paris.

Length, 4 feet 10½ inches. Width, 2 feet. Depth, 8 inches.

2804. PIANO. Compass, 5 octaves and a fifth, F to C. Upright model. Mahogany case supported on four square tapering legs, inlaid with white wood and ornamented with brass mounts. The upper part in cabinet form enclosing the works, the unoccupied space being utilized with shelving. Two glass doors lined with antique white velvet, decorated with painting of musical instruments, much discolored. Keys, ivory naturals, with black sharps. Early English action. Tri-cord throughout. Divided bridge. Two pedals. England, 1801. Maker, W. W. Stodart, Golden Square.

Height, 8 feet 8 inches. Width, 3 feet 7½ inches. Depth, 1 foot 10 inches.

2768. PIANO. Compass, 6 octaves, F to F. Upright model, the upper part square, a column on either side terminating in a foliated capital. The lower part in cabinet form, the keyboard supported by two carved legs and covered by a rounded lid. The case, polished mahogany; the front, above the keyboard, of crimson brocade. Keys, ivory naturals, with black sharps. The usual Broadwood action, leather hammers covered with white felt and hinged with a bit of parchment. The most interesting point is the length of the abstract from the end of the key to the action proper, which is 2 feet and 6 inches. The abstract is attached to the hammer-butt with buckskin, and the damper is also attached to the abstract in this case with wire. Single cord throughout. Length of longest bass string, 5 feet 6 inches; vibrating length of same, 5 feet. Eleven covered bass strings. England. 18th Century. Makers, John Broadwood & Sons.

Height, 6 feet 2½ inches. Width, 3 feet 9 inches.

3347. PIANO LYRE. Compass, 6 octaves, F to F. Upright model, the upper part lyre shape, the lower part in the form of a cabinet. The case mahogany with gilt mounts and a silk front. A medallion in carved wood at the base of the lyre represents the head of Handel (?). Keys, ivory naturals, with black sharps. The loud pedals are placed beneath the keyboard in the centre. The first 21 notes of the bass have two strings to the unison, the remaining notes three strings to the unison. Old German action, with the keys bent at right angles, the hammers striking the strings below the key line. In addition to the usual keyboard, there is a pedal attachment comprising 27 notes, which operates on a second set of strings for which there is also a separate soundboard. The pedal keyboard is placed within the cabinet. Germany. Early 19th Century. The name plate bears the inscription: "Erfunden und verfertigt von J. L. Schliep. Berlin."

Height, 6 feet $10\frac{1}{2}$ inches. Width, 3 feet $7\frac{1}{4}$ inches. Depth, 2 feet $\frac{1}{2}$ inch.

II. PIANOFORTES BY EARLY AMERICAN MAKERS.

CENTRAL CASE.

1199. PIANO. 5 octaves—F to F. Oblong case of mahogany, inlaid with white wood and ornamental lines, resting on a stand with 4 legs, brass mounted. Keys, ivory naturals, with black sharps. A forte lever on the left-hand side of the case raises the dampers. Bi-cord. U. S. A. Late 18th Century. Maker, Chas. Albrecht, Philadelphia. Drexel Collection.

Length, 5 feet $2\frac{3}{4}$ inches. Width, 2 feet 9 inches. Depth, 9 inches.

CASES 136, 137, 138.

2858. PIANO. Compass, 5 octaves and a fifth, F to C. Oblong mahogany case, with inlaid lines. Keys, ivory naturals with black sharps. Bi-cord throughout, the eight lower bass notes overspun. Originally furnished with a forte pedal raising the dampers. U. S. A. c. 1800. Maker, Benjamin Crehore, Boston.

Length, 5 feet $6\frac{1}{2}$ inches. Width, 1 foot $11\frac{1}{4}$ inches. Height, 2 feet $9\frac{1}{2}$ inches.

2812. PIANO. Compass, 6 octaves, F to F. Oblong mahogany case profusely ornamented in gilt and brass moulding, with carved pieces under the keyboard. Carved legs. Keys, ivory naturals with black sharps. Bi-cord; the last eight notes overspun, the six lower notes single. U. S. A. c. 1830. Makers, Loud Brothers, Philadelphia.

Length, 5 feet 9 inches. Height, 3 feet. Width, 2 feet 5 inches.

2945. PIANO. Compass, 6 octaves, F to F. Oblong mahogany case with turned legs. Keys, ivory naturals with black sharps. Bi-cord; the six lower notes overspun. Boston, U. S. A. c. 1833. Maker, Conrad Meyer.

Length, 5 feet $7\frac{3}{4}$ inches. Height, 2 feet $11\frac{1}{4}$ inches. Width, 2 feet $4\frac{1}{4}$ inches.

CLASS II. WIND INSTRUMENTS.¹

SECTION A. WHISTLES AND BEATING REEDS.

CENTRAL CASE.

3516. CHAMBER ORGAN. Compass, 3 octaves and 6 notes—E to C. A tall case of painted wood in two sections ornamented with rococo work (evidently an addition), and gilt moulding, surmounted by two coats of arms. Below the keyboard an oil painting of musicians signed: "Franz Casppar Hofer Inv et pinx A: 1758." Keys of dark wood. At the right three stop-levers. At the back two rows of wooden pipes, stopped diapason, and a double row of metal pipes, open diapason and flute harmonique. The windchest, beneath the keyboard, is fed from bellows in the lower case operated by a strap working through an opening on the side. Maker unknown. Germany. 18th Century.

Height, 6 feet 1 inch. Width, 3 feet 4 inches. Depth, 1 foot 6½ inches.

Many of the original pipes in this instrument are missing and such parts as have been renewed are very imperfect.

3349. PORTABLE PROCESSIONAL ORGAN. Compass, three octaves and a fifth, E to C. A square wooden case of painted wood with doors on the sides. In the back of the case are two bellows, weighted with stone and operated by means of heavy leather straps which pass over rollers and through an opening on the right-hand side of the case. The keys are light wood naturals and black sharps. Three stops, of 45 notes each, are regulated by means of metal levers at the treble end of the keyboard. Two of these stops are of wood throughout, resembling the stopped diapason and concert flute of to-day; the other of metal, is of flute quality and has a break in the upper octave. The pipes run from low E up six notes in whole tones, from which point they proceed in half-tones as in the modern organ. Straubing, Bavaria. c. 1700-1720.

Height, 2 feet 10 inches. Width, 2 feet ¾ inches. Depth, 3 feet 3 inches.

This instrument was used in religious processions until superseded by the Harmonium.

¹ For examples of Class II, Wind Instruments, see page 53; also Hand-Book No. 13, Europe, page 114 ff.

2803. PIANO WITH PIPE ORGAN ATTACHMENT.

Compass, five octaves, F to F. Mahogany case, in cabinet form, with lines of black and white inlay. Oval openings on the side panels, with ornamental wire net-work backed with crimson cloth much discolored by age. Keys, ivory naturals, with black sharps. Double strung in the bass, the thirteen upper notes tri-cord, the remainder bi-cord. The dampers are divided into treble and bass sections, raised by two stops on the left-hand side of the case. A third stop operates a damper for silencing all the strings. The organ attachment extends from lower C to F—54 notes. Wooden pipes, 8 foot pitch, the lower 19 melodia or stopped diapason. A pedal on the right-hand side, also one in front, for blowing the organ. Marks in the lower part of the case indicate that a pedal attachment for thirteen bass notes at one time formed part of the instrument. This addition was evidently of rude workmanship, and is now missing. Long sticker action connects the keyboard with the valves. The pipes are placed horizontally beneath the keyboard, the air reservoir placed at the side. On one of the organ pipes is a label inscribed as follows: "Made by Eaton Pet— (?) in the year of our Lord, 1786." England. c. 1780. The piano bears the name of Longman & Broderip, musical instrument makers, 26 Cheapside and No. 13 Hay Market, London.

Length, 5 feet 6 inches. Height, 3 feet 1 inch. Depth, 1 foot 11 inches.

2741. CLAVI ORGANUM. Compass, 4 octaves, C to C; lower C sharp missing. The exterior of the case decorated with gilt figures in relief, probably Dutch work in Japanese style. This instrument was made by order of the Elector of Hanover, afterward George I. of England, for presentation to his regimental chaplain, who rendered the Elector an important service. The landscape on the interior of the cover represents Schulenberg Castle, the residence of the Elector. Keys, black naturals, with white sharps; the front and sides of the latter red; the black keys inlaid with a design in metal dots. The nameboard inlaid with ebony and ivory. This instrument was originally a harpsichord and an organ of forty-eight pipes, the former having been transformed into a piano with an octave stop; the action is early English, the strings fastened to the hitch-pins by means of eyes. The soundboard bridge is furnished with two sets of pins to procure the bearings of the strings. The octave hammers are on wire shanks, the others on wood. The action-jack has no escapement. The hammer is hinged to the rail with a slip of parchment. The soundboard still keeps the rose. The vibrating length of the longest double

strings is 5 feet 6 inches; that of the longest octave string, 3 feet 6 inches; the vibrating length of the shortest double strings is 6 inches; that of the shortest octave string, 3 inches. The octave strings lie on their own bridge. The organ attachment has 48 wooden pipes, stopped diapason, 8 foot pitch. The valves are placed beneath the lower keyboard and are operated by sticker action, a loose jack topped by a wire screw with a padded button depressed by the key. The keyboards are controlled by two pairs of buttons. The lower keyboard plays the organ with or without the piano, the upper plays the octave attachment; but this may be "coupled" with the lower octave and organ by shifting the position of the keyboard. The name of the maker inlaid in metal, similar to the decoration on the keys, as follows: "Hermans Wil-len Brock, Orgel und Instrumend Macher zu Hannover, A. D. 1712."

Length, 7 feet 5½ inches. Height, 3 feet 7 inches.

3348. REGAL. Compass, 4 octaves, C to C. An oblong case of stained wood containing a keyboard with dark wood naturals and white sharps. Back of the keys are a series of small wooden pipes fitted with beating reeds connecting with the bellows by means of a square wooden wind-way. The bellows are four-fold and are operated alternately by means of wooden handles at the opposite end from the keyboard. The whole instrument rests on a stand of natural wood. Camenz, Schlesien, Germany. 1720-1740.

Keyboard: Length, 2 feet 8 inches. Bellows: Length, 2 feet 9 inches; width, 9 inches. Stand: Height, 3 feet; width, 2 feet 7 inches; length, 3 feet 8 inches.

3517. REGAL. Compass, 3 octaves and 6 notes, E to C. An oblong case of black walnut in two parts, each containing a bellows. These are adjusted at the back of the keyboard and by working them alternately air is supplied to a row of metal pipes fitted with beating reeds placed immediately behind the keys. The keys are light wood naturals with black sharps. Maker unknown. Germany. 18th Century.

Length, 3 feet 4 inches. Width, 2 feet 2½ inches. Depth, 4 inches.

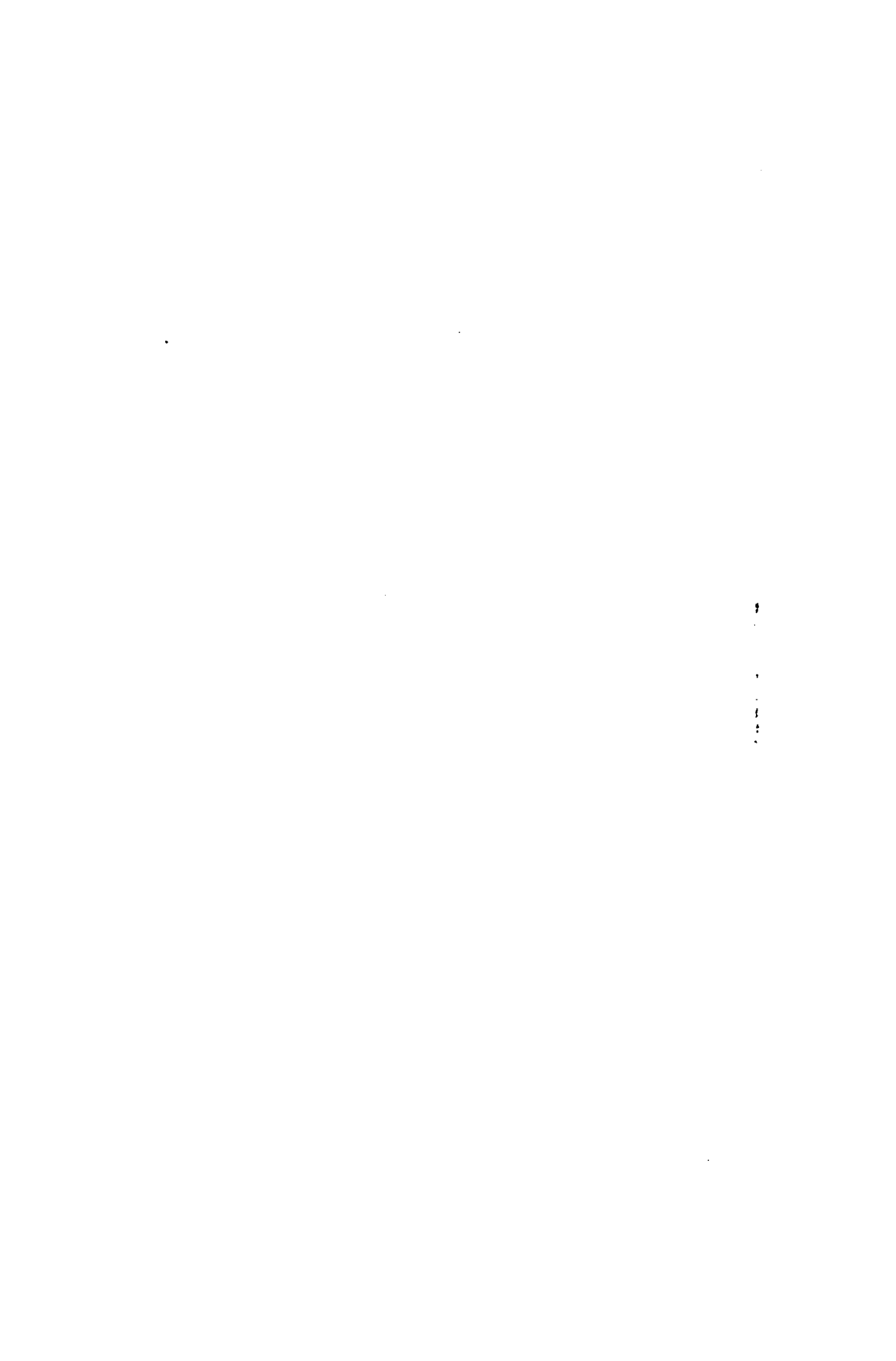
CLASS II. WIND INSTRUMENTS.

SECTION B. FREE REEDS.**CENTRAL CASE.**

2776. **ORGANO PIANO.** Compass, 3 octaves and a third, C to E. Rosewood case in cabinet form. Keys, ivory naturals, with black sharps. The most interesting point in the action is the key, which is padded at the back end and so heavily leaded as to stop the ventril perfectly when at rest. The piano action is simple. The soundboard carries a stout rim for the hitch-pins at least $3\frac{1}{2}$ inches thick. Bi-cord in the treble. The bass strings rim into a metal shoe at the base. Regulating screws on a rail in front of the hammer-butts produce the escapement of the hammer after the stroke. There is no back check to the hammer; the dampers, however, are controlled by two springs, one of which on the spring-rail presses the damper against the string. U. S. A. 19th Century. Maker unknown.

Height, 3 feet $8\frac{1}{4}$ inches. Width, 2 feet $1\frac{1}{2}$ inches. Depth, 1 foot 8 inches.

VI. MUSICAL ACCESSORIES.



VI.

MUSICAL ACCESSORIES.

INTRODUCTORY NOTE.

The plaster casts here exhibited are from ancient and mediaeval sculpture, and represent the musical instruments of those early centuries. They are reproductions taken from the Hall of Architectural Casts and adjacent galleries on the first floor of the Museum, and are placed with this Collection as further illustrating the period covered by the drawings in Cases 110-112.

Among the books in the Museum Library, those given in the list hereto appended will be found of value to students interested in music and musical instruments. The Library may be entered from Gallery 15, on the second floor of the Museum, and is open daily, Sundays excepted, from 10 A. M. until 4 P. M.

CATALOGUE

I. CASTS ILLUSTRATING ANCIENT MUSICAL
INSTRUMENTS.

(West Wall.)

OVER CASES 110-112.

3496. TRIGONON. ASSYRIA. Low-relief. Section of panel: King offering libation after lion hunt. From the Palace of Asurnazirpal. Original, now in the British Museum, found in the mound at Nimrud (Calah).

Height, 3 feet 2 inches. Width, 2 feet $7\frac{1}{4}$ inches.

The mounds of Nimrud, supposed to be the site of the Tower of Babel, were located near the river Tigris, in the vicinity of Mosul, Asiatic Turkey. Asurnazirpal was king of Assyria B. C. 885-860.

See also Engel, "Musical Instruments in the South Kensington Museum," p. 23 ff. Smith's "Dictionary of Greek and Roman Geography," London, 1878, article on "Babylonia," vol. i., p. 360. Porter's "Travels in Georgia," London, 1822, p. 305 ff. Rawlinson's "Ancient Monarchies," London, 1862, vol. i., p. 428 ff.

3497. TRIGONON. ASSYRIA. Low-relief. Section of panel: King and Queen banqueting in garden. From the palace of Asurbanipal, Kuyunjik. Originals in the British Museum.

Height, 1 foot $8\frac{1}{2}$ inches. Width, 1 foot $8\frac{1}{2}$ inches.

Asurbanipal (Sardanapalus), king of Assyria, B. C. 668-626, the last king who reigned over Babylon.

See also Rawlinson's "Ancient Monarchies," London, 1862, vol. i., p. 438. Harper's "Dictionary of Classical Antiquities," New York, 1898. Articles on Babylonia, Assyria, Sardanapalus.

3498. HARP and DOUBLE PIPES. ASSYRIA. Low-relief from the Palace of Asurbanipal, Kuyunjik. King and Queen banqueting in the garden. Original in the British Museum.

Height, 1 foot 10 inches. Width, 1 foot 8 inches.

3499. LYRE or KITHARA. Low-relief. Alkaïos and Sappho.
Height, 11 inches. Width, $9\frac{1}{4}$ inches.
3500. LYRE or KITHARA. GREECE. High-relief. Nike pouring a libation to Apollo Citharædus, attended by Leto and Artemis. Original, now in the Royal Museum, Berlin, found in the Villa Albani at Rome.
Height, 2 feet 4 inches. Width, 3 feet $4\frac{1}{4}$ inches.
3501. LYRE or KITHARA. GREECE. Low-relief. Apollo Citharædus and Muses. Original found in Icaria of Attica. Palaio Stamata.
Height, 1 foot 7 inches. Width, 1 foot 5 inches.
3502. LYRE or KITHARA. GREECE. Low-relief. Marriage ceremony of Hebe to Hercules. Original, by Callimachus, found serving as a well-curb at Corinth, now in the British Museum.
Height, 1 foot 7 inches. Width, 11 inches.
3503. LYRE or KITHARA and DOUBLE PIPES. Low-relief. Musical contest between Apollo and Marsyas in the presence of Muses. Original now in the National Museum, Athens, found at Mantinea in Arcadia.
Height, 3 feet 2 inches. Width, 4 feet 5 inches.
3495. PLAGIAULOS. GREECE. Statue. Midas, (?) Sicilian flute player, who twice obtained the laurel wreath for his performances on the flute at the Pythic games, and to whom Pindar inscribed an ode. Original statue, now in the British Museum, found in the Villa of Antonius Pius, near Civita, Lavinia. First Century.
Height, 3 feet $3\frac{1}{2}$ inches.
See also Catalogue of Greek Sculpture, British Museum, London, 1904, No. 1745, p. 98, and Hermann Smith's "World's Earliest Music," p. 126 ff. Scribners, New York.
3504. PORTATIVE ORGAN. EUROPE. Low-relief. Italian Gothic. Kneeling angel holding a small organ.
Height, 1 foot. Width, 9 inches.
3505. DOUBLE PIPES. EUROPE. Low-relief. Italian Gothic. Kneeling angel playing on double pipes.
Height, 1 foot. Width, 11 inches.

3506. PSALTERY. FRANCE. High-relief. Figure from the west façade of the Chartres Cathedral. 11th-12th Century.
Height, 4 feet 1 inch. Width, 1 foot 6½ inches.

3507. VIOL. FRANCE. High-relief. Figure from the west façade of the Chartres Cathedral.

Height, 4 feet 1 inch. Width, 1 foot 6½ inches.

This and the preceding figure (3506) are two of twenty-four described in the following paragraph:

"The central doorway is called the Porte Royale, the kings of France having been usually received at this entrance of the church; . . . Below the sculpture is a compartment or frieze, containing bas-relief figures of the prophets, in number fourteen, this is continued on the sides of the recessed arch; and here are represented the twenty-four elders of the Apocalypse holding various musical instruments, and with cups filled with perfume, who are supposed to be singing to the marriage of the Lamb a new canticle with the harp, cithern, and psaltery. Amongst the instruments of music, which are curious and interesting for their peculiarity of form, are violins with three and four strings each." "French Cathedrals," B. Winkles, London, 1837, p. 72.

MUSICAL LITERATURE.

Among the books relating to Musical Instruments in the Library of the Museum the following may be named.

- ADLER & CASANOWICZ. *Biblical Antiquities*. Smithsonian Institution, U. S. National Museum Report, 1896. Ill.
- ALLEN, E. H. *Violin Making*. London, 1884. Ill.
- AMIOT, PÈRE. *Mémoire sur la Musique des Chinois*. Paris, 1779. Ill.
- ANKERMANN, DR. *Die afrikanischen Musikinstrumente*. Museum für Völkerkunde, Ethnologisches Notizblatt. Berlin, 1901. Ill.
- APTHORP, WILLIAM FOSTER. See *Cyclopedia of Music and Musicians*.
- ARBAUD, DAMASE. *Chants Populaires de la Provence*. Aix, 1862.
- BAKER, THEODORE. *Biographical Dictionary of Musicians*. New York, 1900. Ill.
- BIERDIMPFL, K. A. *Die Sammlung der Musikinstrumente des Baierischen Nationalmuseums*. München, 1883.
- BIRDWOOD, GEORGE C. M. *The Industrial Arts of India*. South Kensington Art Handbooks. London, 1880. Two vols. Ill.
- BONANNI, P. FILIPINO. *Descrizione degl' Istromenti Armonici*. Roma, MDCCCVI. Two vols. Ill.
- BRAUND, JOHN. *Illustrations of Furniture, Candelabra, Musical Instruments*. . . . from palaces and mansions. London, 1858. Ill.
- BROWN, MARY E. and REV. WILLIAM ADAMS. *Musical Instruments and their Homes*. New York, 1888. Ill.
- CARMICHAEL, S. *A new Dictionary of Musical Terms*. London, 1878.
- CATALOGUES of Collections of Musical Instruments:
- Cairo. *Guide to the Cairo Museum*. G. Maspero. 1903.
- Berlin. *Königliche Hochschule für Musik. Führer durch die Sammlung alter Musikinstrumente*. Dr. Oskar Fleischer, 1882.
- Museum für Völkerkunde. *Die afrikanischen Musikinstrumente*. Dr. Ankermann. 1901.
- Bologna. *Raccolta di antichi Strumenti Armonici conservati nel Museo Civico*. 1898.
- Boston. *Catalogue of Historical Musical Exhibition*. . . . Chickering & Sons. 1902. Ill.
- Brussels. *Catalogue descriptif et analytique du Musée Instrumental du Conservatoire Royal de Musique*. Victor Charles Mahillon. 1893-1900. Ill.

CATALOGUES of Collections of Musical Instruments—*Continued*:

- Brussels. Catalogue de la Bibliothèque du Conservatoire Royal de Musique de Bruxelles. Alfred Wotquenne. 1898-1901. Three vols.
- Florence. Catalogo della Collezione Etnografico-Musicale Kraus. Sezione Istrumenti Musicali. Alexandre Kraus. 1901.
- Ethnographic Musicale; la Musique au Japon . . . les Instruments Japonais du Musée Kraus. Alexandre Kraus, 1880.
- Leipzig. Katalog des Musikhistorischen Museums von Paul de Wit. 1904.
- London. Descriptive Catalogue of the Musical Instruments in the South Kensington Museum. Carl Engel. 1874.
- Catalogue of International Loan Exhibition of Musical Instruments. Crystal Palace, Sydenham, 1900. F. W. Galpin.
- Modena. Catalogue of the Old Musical Instruments in the Museo Civico. Valdrighi Collection.
- Munich. Die Sammlung der Musikinstrumente des Baierischen Nationalmuseums. K. A. Bierdimpfl. 1883.
- New York. Catalogue of the Crosby Brown Collection of Musical Instruments in the Metropolitan Museum of Art. 1901-1905. Five vols. Ill.
- Nuremberg. Sammlung des Germanischen Museums.
- Paris. Le Musée du Conservatoire National de Musique. Gustave Choquet. 1875.
- Rome. Annuario della Regia Accademia di S. Cecilia. 1900.
- Venice. Museo Civico e Raccolta Correr; Elenco degli Oggetti Esposti. 1899.
- Verona. Denominazione e Misure degli Istrumenti Musicali giacenti al Civico Museo e fotografati per ordine Municipale.
- CESNOLA, LOUIS PALMA DI. Cyprus: Its Ancient Cities, Tombs, and Temples.
- CHAMPLIN, JR. See Cyclopaedia of Music and Musicians.
- CHAPPELL, WILLIAM. The History of Music. London, n.d. Ill.
- CHAPPELL, W. The Ballad Literature and Popular Music of the Olden Time. London, n.d. Two vols. Ill.
- CHEYNE, T. K. Encyclopaedia Biblica. New York, 1902. Ill.
- CHICKERING & SONS. Catalogue of Historical Musical Exhibition. Boston, 1902. Ill.
- CHORON, ALEXANDRE. A Dictionary of Musicians. London, 1824. Two vols.
- CHOQUET, GUSTAVE. Le Musée du Conservatoire National de Musique. Catalogue. Paris, 1875.

- CLÉMENT, FÉLIX. *Histoire de la Musique depuis les temps anciens jusqu'à nos jours*. Paris, 1885. Ill.
- CONESTABILE, GIOVANNI CARLO. *Vita di Niccolo Paganini da Genova*. Perugia, 1851. Ill.
- CULWICK, JAMES C. *The Distinctive Characteristics of Ancient Irish Melody: The Scales*. Dublin, 1897.
- Cyclopedia of Music and Musicians*. Edited by John Denison Champ-
lin, Jr. Critical Editor, William Foster Apthorp. New York,
1888-90. Three vols. Ill.
- DALYELL, JOHN GRAHAM. *Musical Memoirs of Scotland*. London, 1849.
- DAY, C. R. *The Music and Musical Instruments of Southern India*.
London and New York, 1891. Ill.
- DE MORTILLET, G. et A. *Musée Préhistorique*. Second edition. Paris,
1903. Ill.
- DENNIS, GEORGE. *The Cities and Cemeteries of Etruria*. Third Edi-
tion. London, 1883. Two vols. Ill.
- DE WIT, PAUL. *Katalog des Musikhistorischen Museums*. Leipzig,
1904.
- ENGEL, CARL. *The Music of the Most Ancient Nations*. London, 1864.
A Descriptive Catalogue of the Musical Instruments in the South
Kensington Museum. London, 1874.
Musical Instruments. London, 1875. Ill.
Researches into the Early History of the Violin Family. London,
1883. Ill.
- FERGUSON, JAMES. *Tree and Serpent Worship*. . . . Second edi-
tion. London, 1873. Ill.
- FÉTIS, FRANÇOIS JOSEPH. *Histoire Générale de la Musique*. Paris, 1869-
76. Five vols. Ill.
- FINSCH, OTTO. *Di alcuni Strumenti Musicali della Micronesia e della
Melanesia*. . . . Estratto dall' Archivio per l'Antropologia
e la Etnologia. Vol. xvii. Fas. I. 1887.
- FLEISCHER, OSKAR. *Königliche Hochschule für Musik. Führer durch
die Sammlung alter Musikinstrumente*. Berlin, 1882.
- FLEURY, ÉDOUARD. *Les Instruments de Musique sur les Monuments du
Moyen-âge du Département de l'Aisne*. Laon, 1882. Ill.
- GALPIN, F. W. *Catalogue of International Loan Exhibition of Musi-
cal Instruments*. Crystal Palace, Sydenham, 1900.
- GRILLET, LAURENT. *Les Ancêtres du Violon*. Paris, 1901. Two vols.
Ill.
- GROVE, GEORGE. *Notes on Siamese Musical Instruments*. London, 1885.
Ill.
- Haweis, HUGH REGINALD. *Old Violins*. London, 1898. Ill.
- HAWKINS, JOHN. *A General History of the Science and Practice of
Music*. London, 1776. Ill.

- HIPKINS, ALFRED JAMES. *Musical Instruments, Historic, Rare, and Unique*. Edinburgh, 1888. Ill.
- HOPKINS, EDWARD J. *The Organ: Its History and Construction*. London, 1855. Ill.
- HOWARD, ALBERT A. *The Tibia*. Harvard Studies in Classical Philology. Boston, 1893. Ill.
- JOHNSTONE, JOHN. *A Journey from India to England*. London, 1818. Ill.
- KING, EDWARD. *Munimenta Antiqua*. London, 1799-1805. Four vols. Ill.
- KRAUS, ALEXANDRE, FILS. *Ethnographie Musicale; la Musique au Japon*. Florence, 1880. Ill.
- Di alcuni Strumenti Musicali della Micronesia e della Melanesia regalati al Museo Nazionale d'Antropologia e di Etnologia dal Dott. Otto Finsch. 1887.
- Catalogo della Collezione Etnografico-Musicale Kraus in Firenze. Sezione Istrumenti Musicali. Firenze, 1901. Ill.
- LAVOIX, HENRI. *Histoire de la Musique*. Paris, n.d.
- LYND, WILLIAM. *A popular account of Musical Instruments and their development, as illustrated by typical examples in the Galpin Collection*. London, 1897. Ill.
- LYON, G. F. *A Narrative of Travels in Northern Africa*. London, 1821.
- MACE, THO. *Musick's Monument*. . . . London, 1676.
- MAHILLON, VICTOR CHARLES. *Catalogue Descriptif et Analytique du Musée Instrumental du Conservatoire Royal de Musique de Bruxelles*. Gand, 1893-1900. Three vols. Ill.
- MANSON, W. L. *The Highland Bagpipe: its History, Literature, and Music*. . . . Paisley, 1901. Ill.
- MASPERO, G. *Guide to the Cairo Museum*. Cairo, 1903.
- MEAD, CHARLES W. *The Musical Instruments of the Incas*. Supplement to the *American Museum Journal*, vol. iii., No. 4. American Museum of Natural History, New York, 1903. Ill.
- NAUMANN, ÉMIL. *History of Music*. Translated by F. Praeger. Edited by F. A. Gore Ousley. London, n.d. Ill.
- Orpheus: or Musical Anthology. Boston, 1850. Ill.
- Photographs of Collections of Musical Instruments:
The Crosby Brown Collection. Two volumes.
Collections in Foreign Museums. Five volumes.
- PIERRE, CONSTANT. *Les Facteurs d'Instruments de Musique. Les Luthiers et la Facture Instrumentale*. Paris, 1893.
- PIGGOTT, F. T. *The Music and Musical Instruments of Japan*. London, 1893. Ill.
- PILLAUT, LÉON. *Instruments et Musiciens*. Paris, 1893.

- PONSICCHI, CESARE.** Il Pianoforte sua origine e sviluppo (con tavole) e Rassegna dell' Esposizione Storica fatta nello Stabilimento Musicale Brizzi e Niccolai nell' occasione delle onoranze a Bartolommeo Cristofori, inventore del pianoforte. Firenze, 1876. Ill.
- PORTER, ROBERT KER.** Travels in Georgia, Persia. . . . London, 1821. Two vols. Ill.
- PORTRAITS OF MUSICIANS.** Five vols.
- PRAETORIUS, MICHAEL.** Syntagmatis Musici Michaelis Praetorii C. Tomus Secundus de Organographia. . . . 1618. Reprint 1844. Ill.
- PULITI, LETO.** Cenni storici della vita del serenissimo Ferdinando dei Medici Granprincipe di Toscana e della Origine del Pianoforte. Firenze, 1874. Ill.
- PYNE, J. KENDRICK.** List of Musical Instruments, principally illustrative of the History of the Pianoforte. Manchester, n.d.
- RIAÑO, JUAN F.** Critical and Bibliographical Notes on Early Spanish Music. London, 1887. Ill.
- RIMBAULT, EDWARD F.** History of the Organ. (See Hopkins.)
 The whole Book of Psalms, with their wonted tunes. . . . Thomas Este, A.D. 1592. London, 1844.
 The Pianoforte; Its Origin, Progress, etc. . . . London, 1860. Ill.
- ROWBOTHAM, JOHN FREDERICK.** A History of Music to the Time of the Troubadours. London, 1893.
- REVIEWS** of the Catalogue of the Crosby Brown Collection of Musical Instruments. Science, Charles K. Wead, June 13 and November 28, 1902. New York.
- SMITH, FANNY MORRIS.** A Noble Art. Three lectures on the evolution and construction of the piano. New York, 1892. Ill.
- SMITH, HERMANN.** The World's Earliest Music. London, n.d. Ill.
- SMITH, WILLIAM.** A Dictionary of Greek and Roman Antiquities. Third edition. London, 1890-91. Two vols. Ill.
- SPILLANE, DANIEL.** History of the American Pianoforte. New York, 1890. Ill.
- STAINER, JOHN.** The Music of the Bible. . . . London, n.d. Ill.
- STRUTT, JOSEPH.** The Sports and Pastimes of the People of England. London, 1833. Ill.
- TAGORE, SOURINDRO MOHUN.** Yantra Koshah; or, A Treasury of the Musical Instruments of Ancient and of Modern India and of various other countries. Calcutta, 1875. Ill.
 Short Notices of Hindu Musical Instruments. Calcutta, 1877.
 Hindu Music from Various Authors. Calcutta, 1882.

TAGORE, SOURINDRO MOHUN—*Continued*:

The Musical Scales of the Hindus. . . . Calcutta, 1884.

The Twenty-two Musical Srutis of the Hindus. Calcutta, 1886.

VAN AALST, J. A. Chinese Music. Shanghai, 1884. Ill.

VANDER STRAETEN, EDMOND. La Musique congratulatoire en 1454 de
Dijon à Ratisbonne. Bruxelles, 1889.

VIDAL, ANTOINE. Les Instruments à Archet. . . . Paris, 1876-8.
Three vols. Ill.

VILLEVIEILLE, L'ABBE. Recueil des plus anciens Noël's provençaux con-
servés à la metropole d'Aix où ils sont exécutés chaque année.
Aix, 1889.

WEAD, CHARLES K. See Reviews.

WELCKER VON GONTERHAUSEN, HEINRICH. Der Flügel oder die Be-
schaffenheit des Piano's in allen Formen. . . . Frankfurt
am Main, 1856. Ill.

WILLIAMS, C. F. ABDY. The Story of Notation. London, 1903. Ill.

WILKINSON, Sir JOHN GARDNER. Manners and Customs of the Ancient
Egyptians. New edition revised and corrected by Samuel
Birch. London, 1878. Three vols. Ill.

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